the OIL AND GAS JOURNAL

SEPTEMBER 3, 1956

ANNUAL

Petrochemicals

...Survey and technology

Latest listing of plants and products, plus special articles on new developments

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WILD IRANIAN WELL EXCITES MIDDLE EAST

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Pipeline Giant Moving Into Refining

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South Texas Racks Up a Big One

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How Pipe Was Picked for Casing World's Deepest Well p. 117

500-ton traveling block's sheaves take terrific stress—TIMKEN® bearings keep 'em aligned

THE BREWSTER CO., INC., Shreveport, La., assures positive alignment and easy turning of sheaves in this 500-ton traveling block by mounting them on six two-row Timken tapered roller bearings.

SHEAVES in this Brewster 500-ton dead load capacity traveling block are under terrific stress when drilling is under way. There's the weight of the drill string itself, plus stress from action of the spinning pipe. Add to that the stress as the block swings when it raises and lowers the string. To keep the sheaves perfectly aligned, and assure their taking heavy thrust loads as well as turning easily under heavy radial loads, The Brewster Co., Inc., mounts them on Timken® tapered roller bearings.

Because Timken bearings are geometrically designed and precision-made to have true rolling motion, they practically eliminate friction. Sheaves turn easily and smoothly, allowing fast fall of the block—important in speeding up bit changing. What's more, Timken bearings' rollers and races are case-carburized to have hard, wear-resistant surfaces over tough, shock-resistant cores.

Only Timken bearings give you so many advantages. We even make our own steel, to be sure it's the finest. No other U. S. bearing maker takes this extra quality control step.

So when you buy or build machinery and equipment, specify Timken bearings to get the most for your money in bearing life and performance. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

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TAPERED ROLLER BEARINGS ROLL THE LOAD

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

You can expect offshore operators to be more conservative in future bidding for leases under the Gulf of Mexico.

Reduced allowables, government red tape, and mounting expenses have boosted the odds against success in the tidelands. Even in the past many operators made fabulous offers for submerged leases largely as a defensive measure. Although they weren't ready for big-scale marine exploration, they didn't want to be left out of a play which promises eventually to uncover tremendous oil reserves.

A severe blow to some operators is seen in the production-allowable cut for Pierce Junction field, near Houston. Because of fabulous results of flank exploration in the past 18 months, landowners have been asking—and getting—up to 37½ per cent royalty for leases. "Sure bets" of a few months ago now look like slow payouts—or worse.

Interest is growing in hydrogenation of residuals and in greater hydrogen treating of thermally cracked petroleum fractions.

Engineering economists faced with plotting future markets see octane as a continuing challenge for some time to come. In order to make these higher octane gasolines in greater volumes, they predict wider application of catalytic reforming at higher severities, more hydrogen treating across the board, and adoption of isomerization.

Beyond these established techniques their crystal balls are cloudy. But hydrogenation of heavy bottoms fractions, plus a new breakthrough in radiation processing, appear as possibilities.

Southwest Texas may be on the verge of a new era of deep exploration for Lower Cretaceous reservoirs, especially in the prolific Edwards limestone. Recent strikes at 10,000-12,000-ft. levels in LaSalle and McMullen counties, and a new one in Atascosa County, are pushing the play ever closer to the Gulf Coast.

Look for a new drive next year for federal standards of safety for natural-gas pipelines. Key man behind the move is Rep. John W. Heselton of Massachusetts.

By not pressing for action last year, he has put himself in line for an early hearing in 1957, if there is no change in committee leadership.

Practically all the pipeline companies opposed the bill originally. But some states have imposed such stiff standards that reports now are that some companies would prefer federal rules applied generally rather than suffer the vagaries of state officials.

The search for stratigraphic oil is completely changing the exploration picture in the Rockies—long the domain of the weather-beaten surface geologist.

Oil companies are turning to intense subsurface studies that in the long run should uncover new oil fields. Bisti-Black Rock, in Northwest New Mexico, is a good example of strat oil. Aneth in southeastern Utah is the prize discovery to date in 1956, and production there undoubtedly is related at least in part to stratigraphy.

The OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY—OPERATION

Refining-Processing

SPECIAL PETROCHEMICAL SECTION **89-113**

Annual Survey of Petrochemical Plants **89**

By La Wanda Turner

A company-by-company and plant-by-plant survey of United States petrochemical plants, planned, under construction, and operating. For the first time this survey includes key operating personnel and a resume of 1956-1957 activities involving new plants, expansions, new products, processing changes, etc. The survey is divided into five tables: (1) organic chemicals; (2) nitrogen chemicals; (3) butadiene and copolymer plants; (4) sulfur plants; and (5) carbon-black plants.

Expanding Facilities of National Petrochemical **105**

By John C. Reidel

The history of the 5-year-old Tuscola, Ill., plant of National Petrochemicals Corp. is one of constant growth and expansion. Several additions have been made to the processing facilities in the last year. The alcohol plant has been expanded, polyethylene and ammonia plants have started operation, and phosphoric acid and isosebacic acid plants are next on the list.

More Ethylene at Tuscola **108**

Here is a case history of ethylene-plant revisions made in a large installation to obtain increased capacity. The product goes to polyethylene, ethyl alcohol, and ethyl chloride.

New Wrinkles in Ammonia Manufacture at Tuscola **111**

The new U.S.I. ammonia plant uses by-product hydrogen from the ethylene plant. It is purified through a low-temperature cascade system. Final purification is carried out by means of a liquid-nitrogen wash.

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Pipelining

Cleaning a Mountain Pipeline **114**

By A. S. Olson

Using a detergent to clean a pipeline in mountainous country means that great care must be taken to keep the cleaning pigs under control at all times to prevent line damage. Here's how one company did the job.

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Casing for the World's Deepest Well **117**

By Ed McGhee

In casing its record-depth well, Richardson & Bass was faced with extremely high-tensile, collapse, and burst loads. Not only was the well depth great, but tests of formations 5,000 ft. off bottom showed 14,000 psi. The operator had to be prepared for as much as 20,000 psi. on bottom.

That Forward Look in Canadian Drilling **120**

By F. M. J. Valint

Ingenious Canadians are coming to the fore with some new equipment items especially tailored for conditions encountered north of the border. Here's a rundown on some of the more significant time and money-saving pieces of equipment.

Fresh-Water Fracturing—Bane or Boon? **159**

By R. E. Hurst

Expected troubles haven't materialized, and most results are favorable. The process has proved successful in many wells in the San Juan and Permian basins, and appears to hold promise for other areas.

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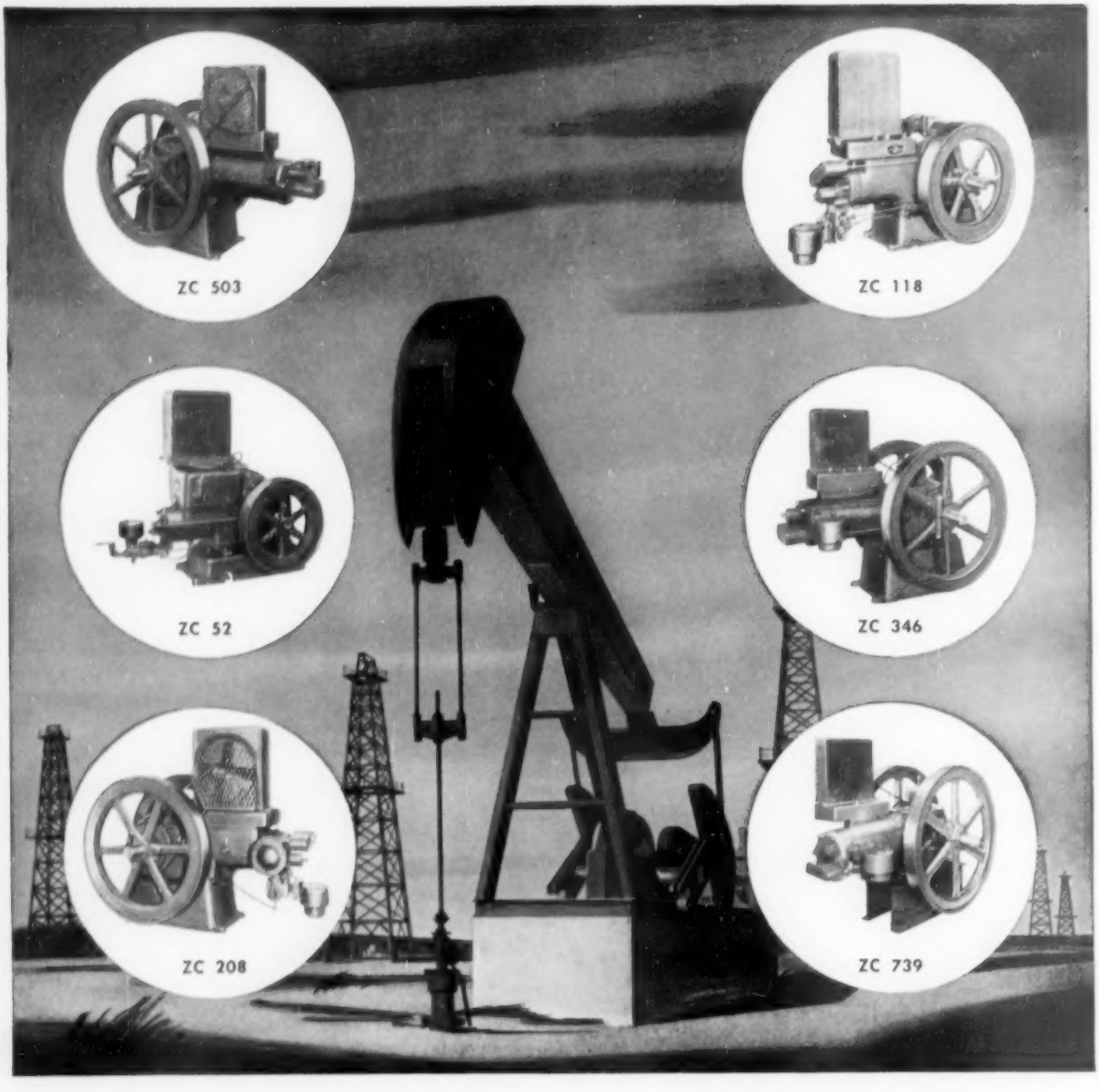

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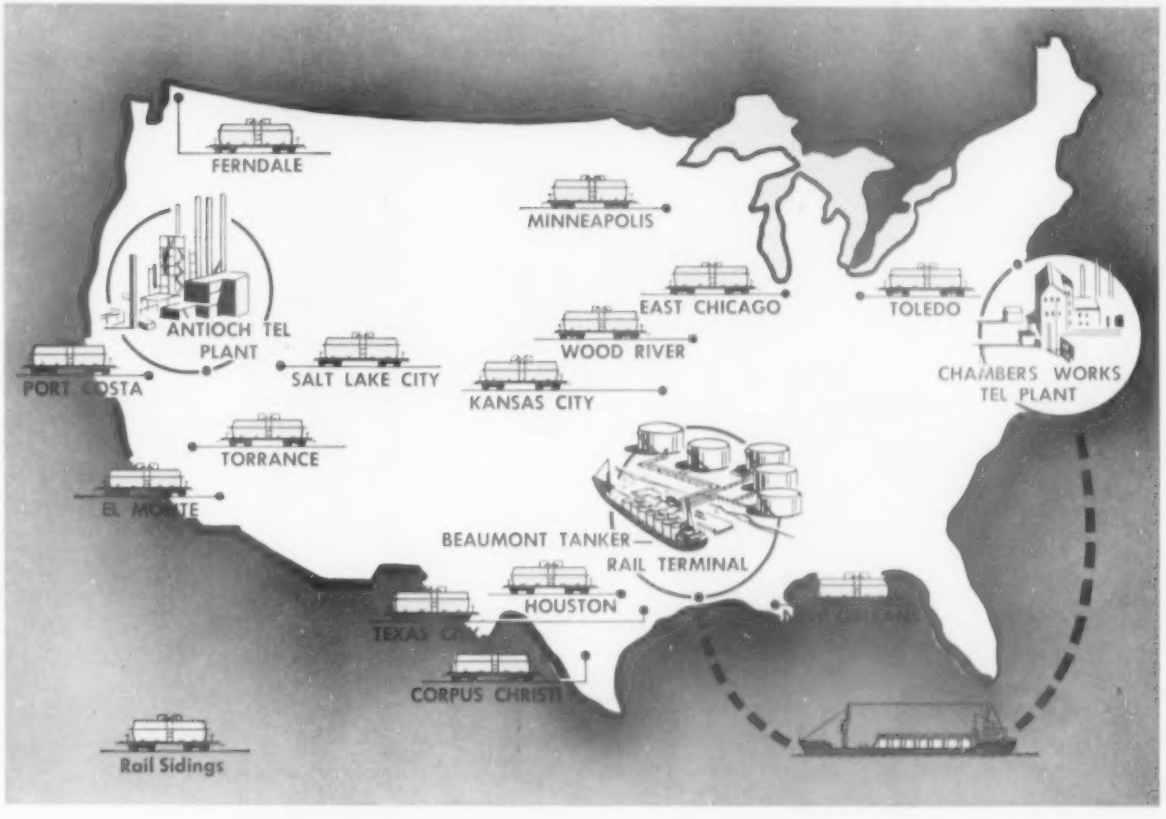

Du Pont's expanded production and delivery program moves ahead

West Coast TEL plant to go on stream by year's end . . . special tanker will transport TEL by sea for first time . . . new Du Pont storage and delivery terminal nears completion at Beaumont, Texas.

The Du Pont Petroleum Chemicals 1956 expansion program is nearing completion. It will meet increasing requirements, insuring ample TEL supplies and fast delivery service to refiners in all parts of the country.

On the West Coast

Du Pont's new TEL plant at Antioch, California, the most modern in the world, is now well over 50% complete. It is expected to go on stream by the end of 1956. Readily accessible to water, truck, and rail transportation, this means larger supplies and faster deliveries for West Coast refineries.

Gulf Coast

A tanker-supplied storage and delivery terminal is nearing completion at Beaumont, Texas. TEL will be transported from Du Pont's Chambers Works at Carney's Point, N. J., to Beaumont in a specially built tanker. This will be the first time TEL has ever been shipped in bulk by sea.

Upon inauguration of this service, Gulf Coast and mid-continent refineries will have additional assurance of ample TEL supplies.

Nationally

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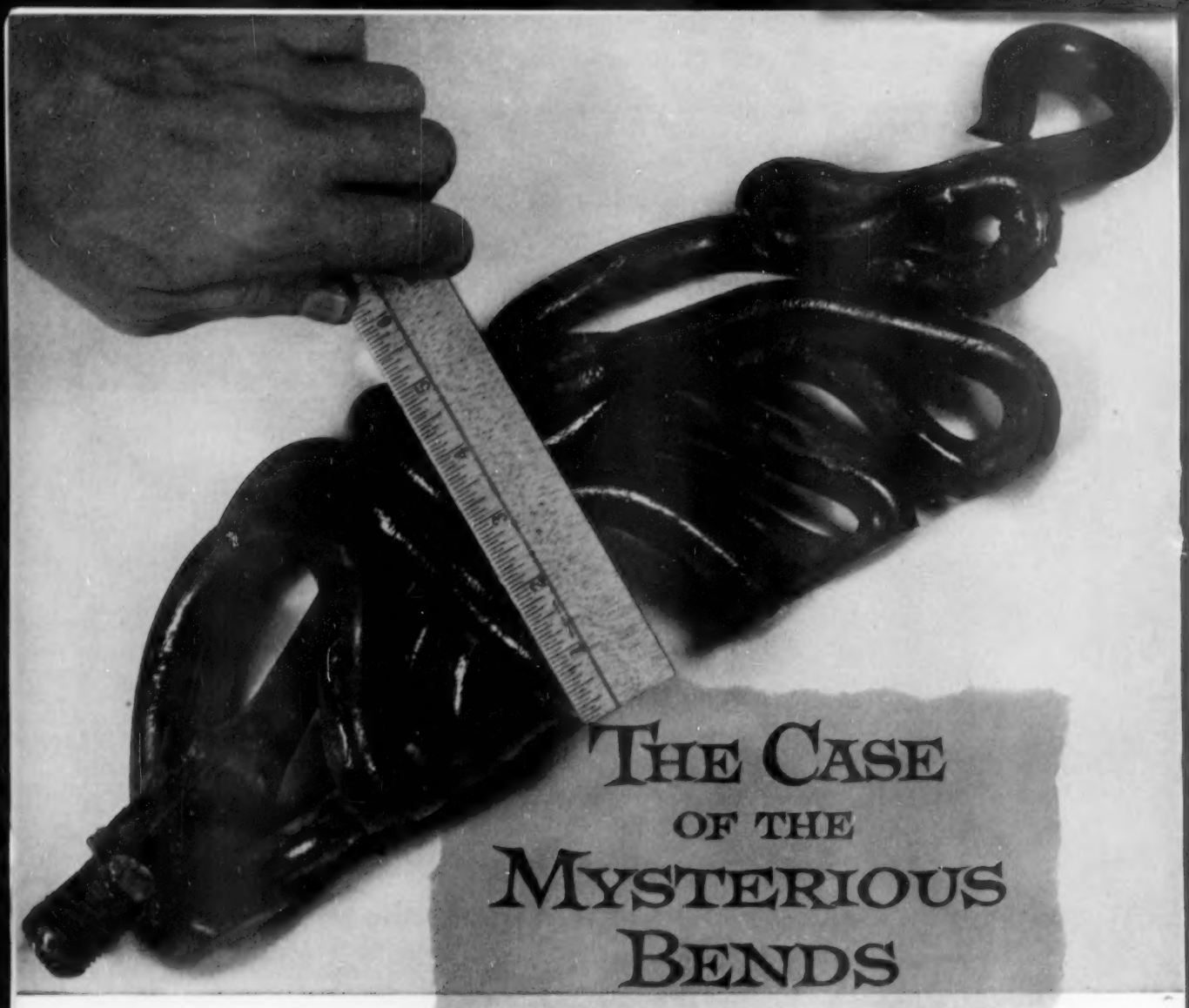

THE CASE OF THE MYSTERIOUS BENDS

IT HAPPENED NEAR CAPROCK, New Mexico. The well quit pumping. Neither the 9000 ft. string of sucker rods nor the tubing could be pulled. What had gone wrong?

The long task of "fishing" and a "work-over" got under way. The foreign-made casing had collapsed in two places. Two joints of tubing had split . . . and from one of these split sections they removed the exhibit shown above.

Fourteen feet of ¾" sucker rods had been compressed into *eighteen inches.*

Have you ever seen a sucker rod so twisted? Like ribbon candy! *Yet the rod didn't break!* (Rod partings shown in the picture were caused by a diamond core bit that milled over the rod during its removal.)

Frankly, it's hard to believe that a sucker rod could be ductile and tough enough to take such terrific bends without fracturing. This phenomena is as surprising as it is mysterious.

The rod is one of ours . . . an "Oilwell" Grade "W"* . . . and it's fully heat-treated to combine high strength with high ductility . . . the kind of rod you can really depend on.

*GRADE "W" is one of our strongest rods . . . recommended for heavy duty in non-corrosive wells and for sulphide service.

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Let's get technical about WALWORTH LUBRICATED PLUG VALVES for pipeline service

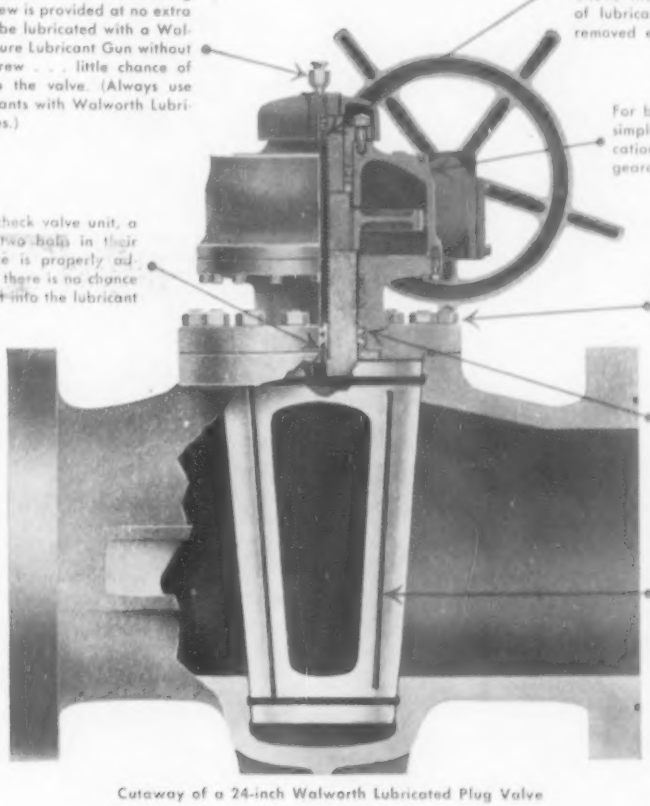
Combination button-head lubricant fitting and lubricant screw is provided at no extra cost. Valves can be lubricated with a Walworth High Pressure Lubricant Gun without removing the screw . . . little chance of grit getting into the valve. (Always use Walworth Lubricants with Walworth Lubricated Plug Valves.)

An added safety feature in the form of a groove cut part way up side of the lubricant-fitting screw allows the operator to observe any tendency of lubricant to blow out before the screw is removed entirely.

For buried pipelines — yoke design permits simple attachment of handwheel and lubrication extensions without modifying the gearcase.

In the stainless steel check valve unit, a transverse pin holds two bolts in their seats. When the valve is properly adjusted and lubricated, there is no chance for line pressure to get into the lubricant system.

Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.



Two overlapping Teflon packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low breakout torque . . . plug turns easier. Packing serves only as a seal and is not used to hold the plug in its seat.

Lubricant grooves completely frame the port openings and encircle the plug at the top and bottom assuring a tight seal against leaks. Bottom circumferential groove is separate from, but connected with, the lubricant well.

Other Walworth Lubricated Plug Valves include Single Gland and Regular Gland types. Sizes to 30 inches. Pressures to 5000 psi and for vacuum service.

Cutaway of a 24-inch Walworth Lubricated Plug Valve

Without exception, a Walworth Ball Bearing Lubricated Plug Valve is easier to operate and maintain than any other type of rotary-action, sealed valve available today for pipeline service. Design features pointed out here show just a few advantages of Walworth Ball Bearing Lubricated Plug Valves.

Many pipeline companies throughout the world use Walworth valves for handling gas, crude, and finished products. Investigate the line of Walworth valves for your own needs. See your Walworth Distributor, or write for literature: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

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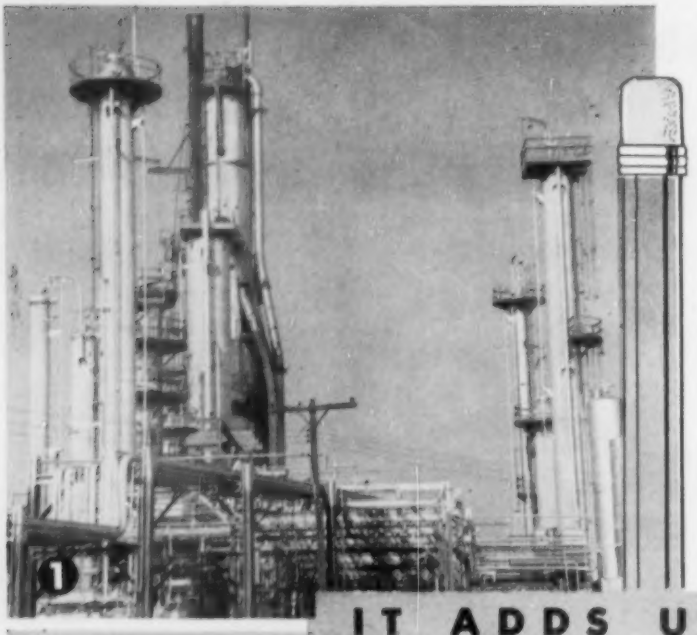
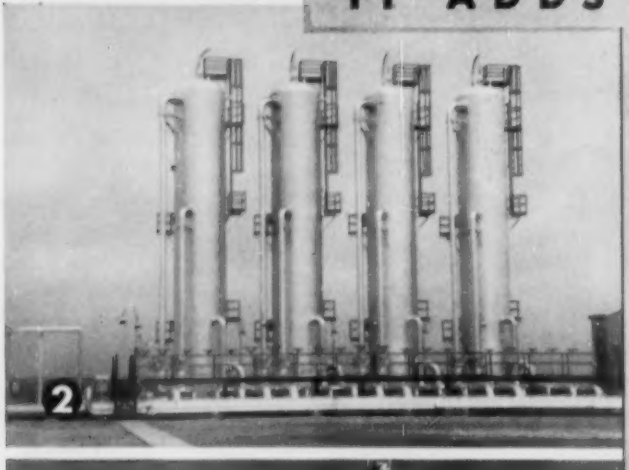
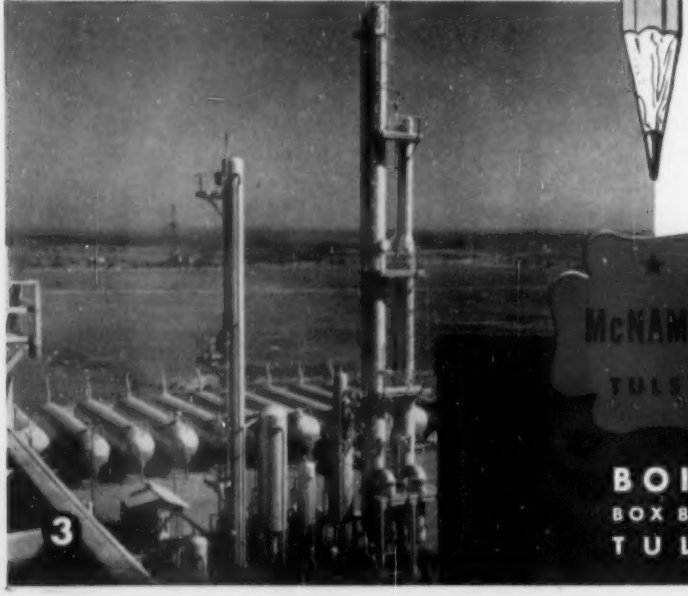


1 Modern polymerization plant — Ardmore, Oklahoma. The vessels were furnished by McNamar.

2 9 ft. by 60 ft., 800 P.S.I. dehydrators — Built by McNamar for main line gas booster station, Spraberry, Texas.

3 Gasoline plant installation — superior design and quality — Snyder, Texas — Manufactured by McNamar.





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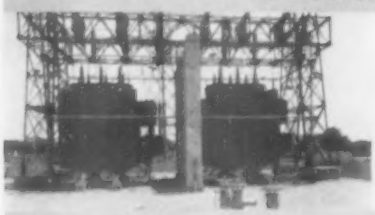
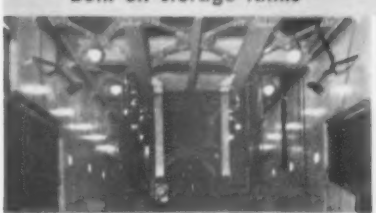
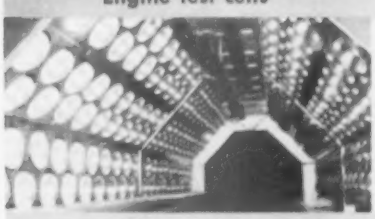
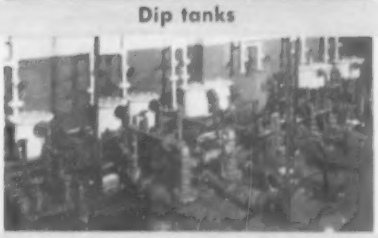
How many of these SPECIAL FIRE HAZARDS does your plant contain?

Practically every manufacturer has what we call "special fire hazards" — extra hazardous areas in his plant where special protection must be provided to insure against possibly serious loss by fire. Some of these hazards are illustrated below, along with the special fire protection systems recommended to arrest fire without delay. And there are many other hazards, too, where major or minor supplements to ordinary-hazard fire protection systems are a positive "must" — if trouble is to be safely avoided.

Grinnell, with 87 years experience protecting against fire hazards of every description, has a fire protection system for every need. Moreover, the installation of the proper Grinnell System usually serves to reduce fire insurance premiums drastically, often pays for itself in a few years. Check your own hazardous areas against the list that follows:

SPECIAL FIRE HAZARD		RECOMMENDED SYSTEM
 Transformers	Propane tanks	**WATER SPRAY** Grinnell ProtectoSpray; Grinnell Mulsifyre Systems
Bulk oil storage tanks	Flammable chemicals storage	**FOAM** Grinnell ProtectoFoam System
 Engine test cells	Dip tanks	**CARBON DIOXIDE** Grinnell CO_2 System
 Infrared driers	 Flammable liquid pumping stations	**DRY CHEMICALS** Grinnell Dry Chemical System

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Beth-Co-Weld is sound, long-lasting pipe, carefully made from a good grade of steel. It has been tried and proved in hundreds of oil-field installations—in fact, it was one of the first fully accepted types of continuous-weld line pipe.

Next time you need pipe we suggest you telephone the nearest Bethlehem Supply store. They carry Beth-Co-Weld, and will be pleased to help you in every possible way.

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Check list of Facts About Beth-Co-Weld

1. Beth-Co-Weld can be furnished to the requirements of ASTM A-120, ASTM A-53, and API 5-L.
2. It comes either coated, uncoated for wrapping in the field, or mill-wrapped.
3. Sizes from ½ in. nominal to 4½ in. OD, both black and galvanized, are furnished in standard weights; sizes from ½ in. through 3 in. nominal also come in extra-strong weights.
4. Sizes 3½ in. OD and 4½ in. OD come in weights lighter than standard.
5. Beth-Co-Weld comes in single mill lengths; also in double mill lengths up to 50 ft for sizes 1½ in. through 4½ in. OD.
6. Wide variety of ends: threaded and coupled; plain end beveled for welding; plain end square cut, grooved for ring joint coupling.

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A Smooth, nonporous, long aging synthetic rubber tube
B Single horizontal braided construction combining strength with light weight and maximum flexibility
C Synthetic rubber cover resists oil, abrasion, sun and aging

G.T.M. offers the hottest thing in fire hose

THERE has long been need for a tougher, lighter weight fire hose with greater resistance to oil, abrasion and weather – especially around refineries and on oil transport vessels.

After thorough analysis of the problem, the G.T.M.–Goodyear Technical Man–and his colleagues, came up with the answer. It is a completely new hose – Style MHB Rubber Covered Fire Hose.

This new rubber hose is exceptionally flexible and light in weight. It is reinforced with a horizontal braid of high tensile synthetic fiber for extra strength. It is mildew inhibited throughout. And its specially developed rubber cover not only resists oil but snagging and hard wear as well.

If you want fire or wash hose that's built to withstand the toughest service, consult your Goodyear Distributor and/or the G.T.M. Or write, Goodyear, Industrial Products Division, Akron 16, Ohio.

RUBBER COVERED FIRE HOSE by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

Mid-Continent Supply Company gives faster service—and improves efficiency—with expanded General Electric two-way radio system

General Electric 2-way radio base station at the Snyder, Texas store handles calls to and from radio-equipped field vehicles in the area. Rig operators want fast action—Mid-Continent cuts time & mileage delays—gives superior service.

DOWN-TIME on an oil rig costs big money. To keep operating, oil men depend on the fast-moving parts and supply services provided by Mid-Continent. In turn, Mid-Continent relies on a recently expanded General Electric two-way radio network to maintain contact with field men working the oil field sites. Supply and service vehicles, equipped with mobile radio, speed customer service by cutting time and mileage delays.

Radio Now Serves Mid-Continent In Five States

Mid-Continent now operates 18 narrow-band G-E transmitters, feeding signals to 89 mobile units in a five-state area. Stores in Texas, Oklahoma, New Mexico, and parts of Colorado and Nebraska are in constant contact with their field men. An emergency repair call relayed to a mobile unit sends a man, or a part, on the way to the job site in a matter of minutes.

2-WAY MOBILE RADIO

New General Electric Progress Line Radio

New Progress Line radios offer complete plug-in chassis design, chassis interchangeability, and they operate on 6 or 12 volt power. Only General Electric mobile radios feature the new 6600 series tubes—manufactured and pre-tested for absolute dependability in 2-way radio circuits. Ask your G-E Communications Counselor for the full details, or, write: *General Electric Company, Communication Equipment, Section X896-3, Electronics Park, Syracuse, New York.* In Canada, write: *C.G.E. Electronics, 830 Lansdowne Avenue, Toronto.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Southwest

HEAVY DUTY PACKAGED GAS COMPRESSOR FOR UNDER 250 H. P.

COMPLETE —
Engine, compressor, scrubbers, cooling and lubricating systems and controls mounted on a floored skid. Components are of the same quality as are found on Southwest's large packaged plants.

RUGGED —
The slow speed (300 rpm), gives this Cooper-Bessemer FMP compressor the stamina needed for continuous operation. Heavy duty poly V-belt drive, 500 H.P. per frame, oversize bearings, are other examples of traditional Cooper-Bessemer quality.

ENGINEERING —
Southwest engineers have designed and built the best low horsepower packaged compressor. It is the rugged, high quality unit in the field.

Here is the heavy duty gas compressor the industry has needed. Not a stripped down model, but a rugged packaged plant designed and built with the same thoroughness that Southwest puts in its larger units. The Cooper-Bessemer compressor cylinder has interchangeable liners and is interchangeable with larger compressors. The same vertical air discharge cooling is used as in integral packaged gas compressor plants. The engineering design features proved by Southwest in integral units are incorporated in this, the first quality packaged gas compressor in the low horsepower field.

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

WELL LOGGING DEEP-WATER GIANTS

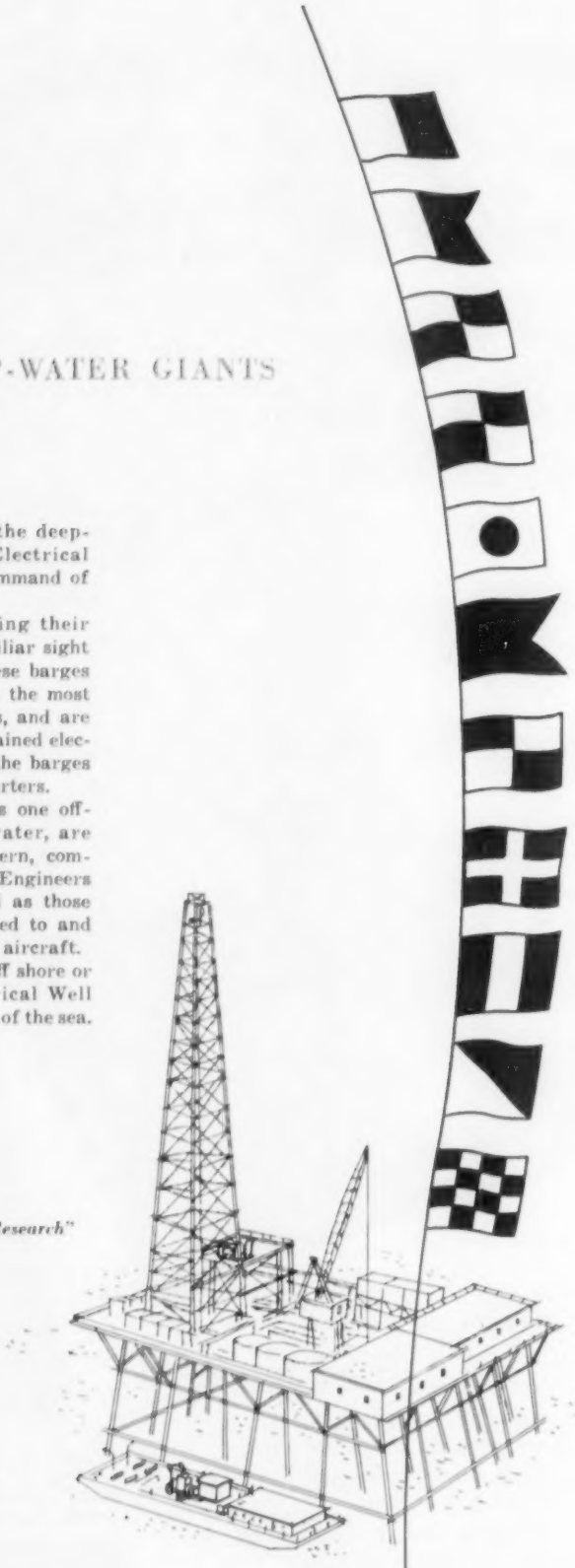
From inshore locations to the deep-water giants, Halliburton Electrical Well Service has a strong command of the sea.

Special EWS barges, flying their Halliburton colors, are a familiar sight along coastal waterways. These barges are completely equipped with the most advanced logging instruments, and are manned by the most highly trained electrical engineers who live on the barges in comfortably furnished quarters.

Deep-water giants, such as one off-shore well in 112 feet of water, are logged by Halliburton's modern, completely-equipped skid units. Engineers manning these units, as well as those on the barges, are transported to and from location by Halliburton aircraft.

You can be sure, whether off shore or in, that Halliburton Electrical Well Service has a strong command of the sea.

"Progress In Service Through Research"

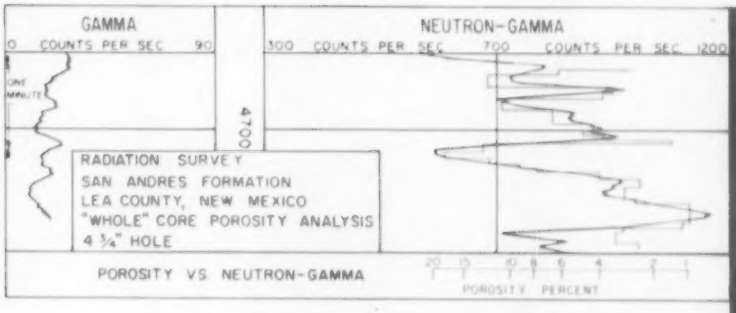


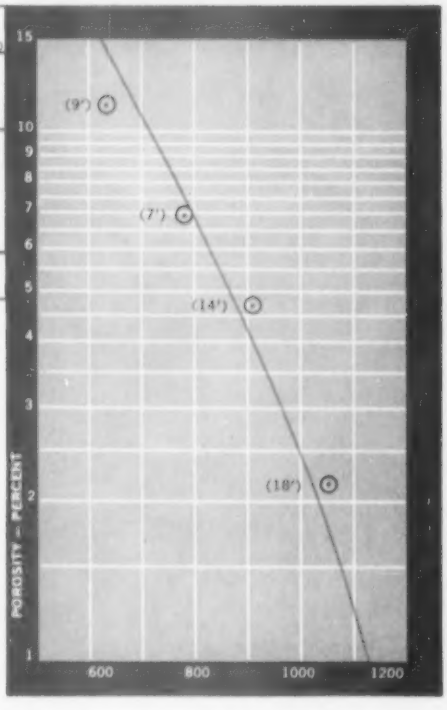
HALLIBURTON OIL WELL CEMENTING COMPANY | DUNCAN, OKLAHOMA

improved log analysis gives

UNMATCHED ACCURACY

Lea County Well's Porosity Nailed Down by Halliburton Radioactivity Survey





NEUTRON-GAMMA COUNTING RATE: COUNTS PER SECOND

A COMPARISON OF THE NEUTRON COUNTING RATE
VS.
POROSITY
OF THE SAN ANDRES FORMATION, LEA COUNTY, NEW MEXICO WITH EXTRAPOLATED TEST WELLS DATA.

(') NO. OF FEET AVERAGED TO OBTAIN POINT SHOWN.

⊙ FROM FIELD WELL

FROM TEST WELLS DATA

HOLE DIAMETER — 4¾"

48' OF CORED SECTION

Here you see convincing evidence of how effective is the recently announced Halliburton improvement in method of radioactivity log analysis. Porosities of most limestones can now be determined from neutron curves with higher accuracy than ever before.

The newly refined technique uses a Halliburton nomograph for relations of neutron count, hole size and porosity... based on laboratory work with holes in blocks of limestone of known porosity... and confirmed by a statistical study of field wells. Application of method depends on precision calibration and high-integrity instrumentation of Halliburton radioactivity surveys.

The four circled points on log paper reflect data from the well whose radioactivity and whole-core porosity curves for 48 feet of formation are also shown here. See how close the points lie to the curve established by Halliburton research. In limestone of low to medium porosity, *no other survey of any type* can match this accuracy.

COMPLETE DATA SENT ON REQUEST

Ask for the publication "Halliburton Radioactivity Logging". It contains the laboratory and field data and the method by which Halliburton customers are given accurate porosity readings from neutron curves in low- and moderate-porosity limestones.

HALLIBURTON

ELECTRICAL WELL SERVICES

You benefit most when you buy

EMSCO

PUMPING UNITS

"Engineered"—not just "built"

Designed and engineered to stand up under hard usage with minimum upkeep.

One of few unit lines available with anti-friction bearings throughout.

Precision-cut gears (not lapped) permit partial replacement in the field when necessary. High hardness gear material stands up under hard wear.

Quick, safe adjustment of counterbalances at ground level by one man. Emsco counterbalances may be adjusted to lead or lag the load as required.

Complete accessories, ground-level lubrication, guards, skid extensions, slide rails and modern brake.

Extra rigid gear case allows precision gears to operate as designed.

No oil seals to wear out in reducer.

Four-legged Samson post is extremely rigid.

Two sumps for oil to drop out emulsions or particles.

There's an Emsco Pumping Unit for every type of well. Send for two colorful new bulletins or see your nearest Continental or D+B store for complete information.

CONTINENTAL

Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY

A Division of The Youngstown Sheet and Tube Company

General Offices: Dallas, Texas

Representatives in all principal oil fields of the world

QUALITY YOUR PRODUCT EMSCO D+B

D+B DIVISION

EMSCO MANUFACTURING COMPANY

Garland, Tex. • LOS ANGELES, CALIF. • Houston, Tex.

General Sales Offices: Dallas, Texas

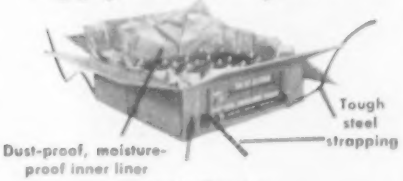
PT-606

Link-Belt maintains the broadest stocks and most complete distribution in the field. And Link-Belt warehouses at strategic points back up distributors —assurance that drillers will be served promptly.

Why LINK-BELT API (SS type) chain goes to work in FACTORY-FINISH CONDITION

Triple-protected—

it's available at leading supply stores everywhere



IF exposed to dirt, grit and moisture, inadequately-packaged chain may leave part of its life in the tool shed. That's why Link-Belt API (SS type) chains are so carefully boxed—to give you *all* the quality, durability and precision you pay for . . . to protect the accuracy, finish and manufacturing refinements built into the most widely used API chains in the field.

Link-Belt boxes are steel-strapped to resist rough handling. The easily-identified fiber carton with no exposed seams is impervious to even the finest sand. And a sturdy inner lining further prevents chain from punching through.

Large stocks of Link-Belt SS-type chains are available everywhere. For the complete story get Book No. 2680. And for prompt, expert service, call your nearest Link-Belt office or any leading supply store.

LINK-BELT

CHAINS AND SPROCKETS

FOUR OF MANY "EXTRAS" YOU GET AS STANDARD ON LINK-BELT API CHAIN

CADMIUM-PLATED PINS. Finish prevents rust, avoids failures due to corrosive fatigue.

GRINDING pins and bushings (*all* contact surfaces) eliminates wear-producing irregularities.

SHOT-PEENED rollers hammered by tiny steel balls have added impact resistance.

COTTERS with patented grooved shank fit tightly in pin hole. Pin is easily removed.

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

J&L PRODUCTION FORMULA:

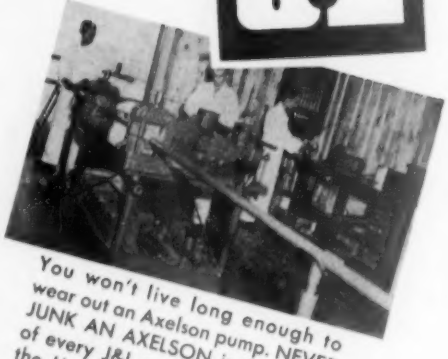
• Lift More Oil • Have Less Trouble

If you have a well you want to pump for more profit, get your J&L store on the 'phone.

This is not advertising license – we mean business.

We have a string of rods and a bottom hole pump made, in effect, for your well. Axelson equipped and J&L serviced, you'll lift more oil and have less trouble. You'll be pumping for more PROFIT.

Let's discuss this. Get your J&L store on the 'phone!



You won't live long enough to wear out an Axelson pump. NEVER JUNK AN AXELSON is the theme of every J&L pump repair shop in the United States and Canada. This one happens to be in Hobbs, New Mexico.

Cabot Pumping Units also play an important part in the J&L formula for profitable production.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

2-G

FIRE!

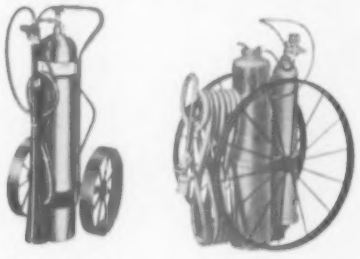
HOW TO DETECT AND EXTINGUISH IT IN SECONDS!

HAND PORTABLES

Carbon Dioxide | Foam Soda-Acid Clear Water Anti-Freeze | Pressurized Water Anti-Freeze | Dry Chemical

Kidde CO_2 portables, either trigger-release type or squeeze-valve type models, are available in sizes from 2½ to 20-pound capacities. New Kidde Wet Chemical extinguishers are available in 2½ gallon bronze or stainless steel models, including pressurized Water or Water-Anti-Freeze units (illustrated). Kidde Dry Chemical extinguishers are available in cartridge-operated models of 20 and 30 pound capacity or pressurized models of 5 and 10 pounds capacity.

MOBILE EQUIPMENT

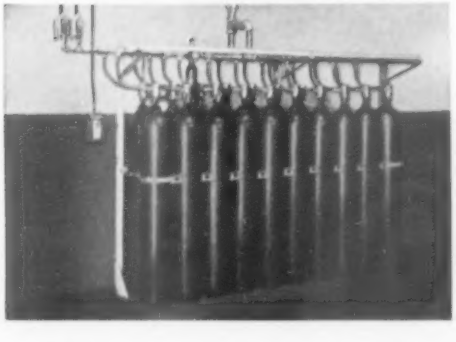


50, 75 and 100 lb. CO_2 Units | 150 lb. Dry Chemical Unit

For major fire hazards, get a mobile unit. Wheeled CO_2 units are available in 50, 75 and 100-pound capacities, in one cylinder.

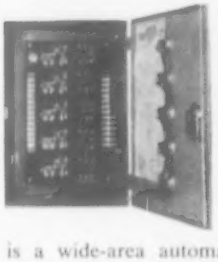
150-pound Dry-Chemical unit has straight stream for long range . . . fan pattern for wide coverage. Both units give expert results even with inexperienced operator.

CO_2 SYSTEMS



New Kidde pressure-operated CO_2 extinguishing systems are individually designed to fully protect even the most dangerous hazards, use no falling weights or clumsy mechanical triggering methods. Pneumatic Control Heads insure instant and complete CO_2 discharge. Directional Valves afford protection to more than one hazard using the same bank of CO_2 cylinders.

ATMO DETECTING SYSTEMS



Kidde-Atmo is a wide-area automatic fire detecting and warning system which works on the principle of rate-of-temperature-rise. It is ideally suited for cases where life protection is of vital importance, or where quick, early detection of fire in valuable materials is essential.

The very first hot breath of fire triggers the system, and sounds the alarm. In addition, the system can also close doors, shut off fans or blowers – all *automatically*.

What's more, the Kidde-Atmo system operates independently of regular power sources, will still give protection even if outside power fails.

Kidde (K Kidde)

Walter Kidde & Company, Inc., 954 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

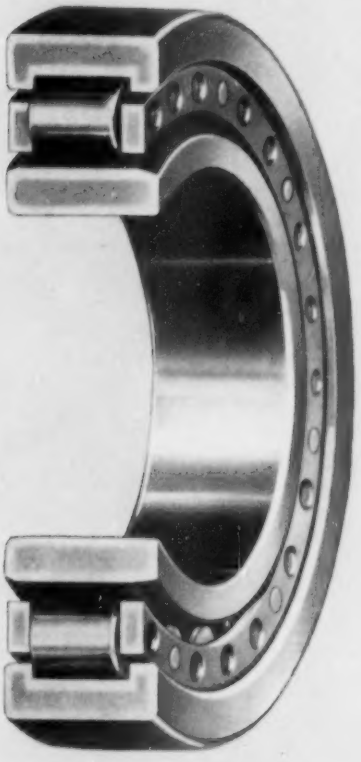
No job too little . . . or none too tough for BOWER STRAIGHT ROLLER BEARINGS

A complete line, a wide range of sizes to fit your specific needs

Square pegs weren't made for round holes. And aircraft bearings aren't built for farm equipment, either. That's why Bower designs a complete line of straight roller bearings—a line broad enough to meet any product requirement.

Jet planes break the sound barrier . . . need bearings that'll keep pace. So Bower aircraft bearings are engineered with exactness and precision to tolerances held to millionths of an inch. Bower tractor bearings, on the other hand, are built for ruggedness . . . to take heavy loads and real punishment, day after day, month after month.

Bower Roller Bearings are proved performers *in every field*, for *any* straight roller bearing application. From motors to earthmoving equipment, they're on the job—cutting maintenance and downtime, setting new standards of efficiency and economy. Get details on the *complete* line from a Bower engineer.



Tapered, Straight and Journal Roller Bearings for every field of transportation and industry

BOWER ROLLER BEARINGS

BOWER ROLLER BEARING DIVISION • FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 14, MICHIGAN

The "extras" cost no more

When you use Rockwell-Nordstrom valves you get "extras" you can't buy in ordinary valves. Pressurized lubrication in the Sealdport* system assures leakproof sealing (without uncertain "forced" seating), and eliminates costly wearing friction. Because they are rotary plug valves, quarter-turn operation and unexposed seating are two more money saving extras. The cost? Rockwell-Nordstrom valves cost no more to buy (often less) than ordinary valves and cost much less to use.

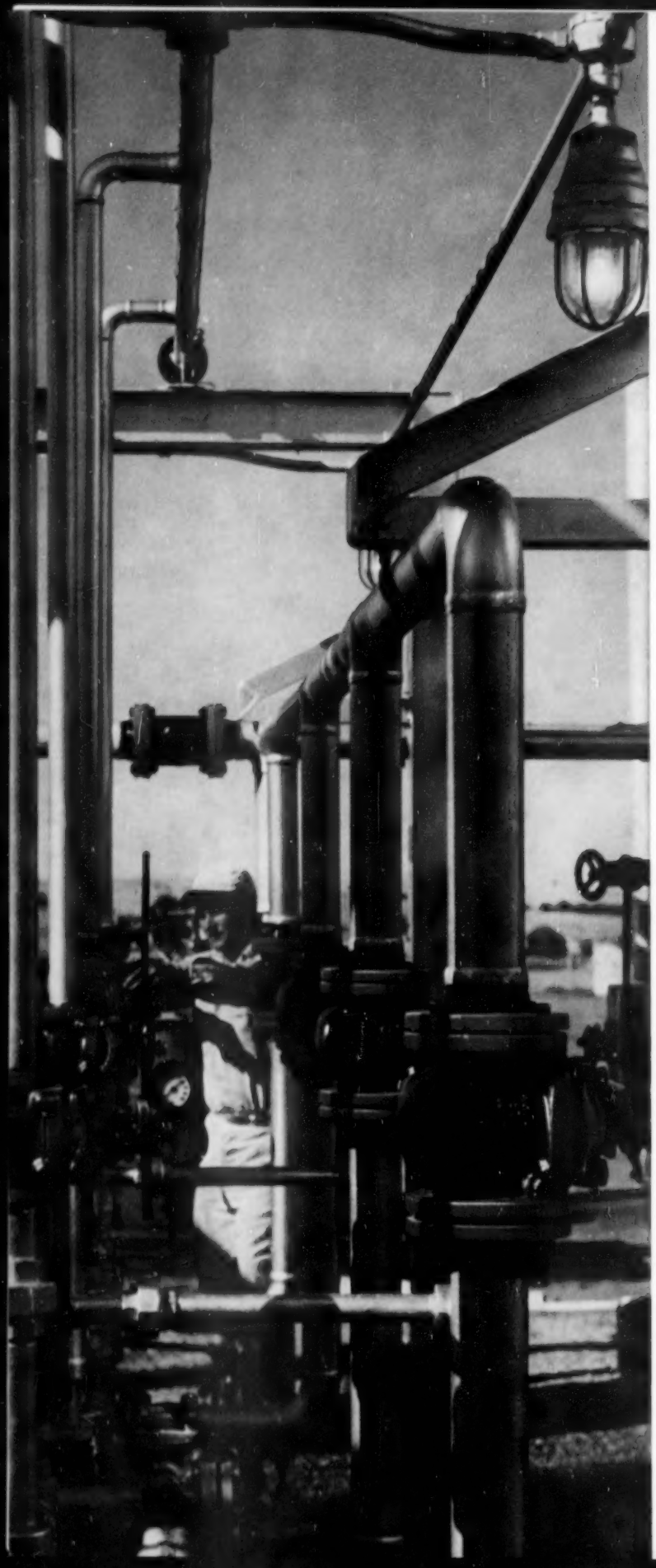
Forty years of lubricated plug valve leadership by the original and world's largest manufacturer is your assurance of economy and trouble-free dependability when you specify Rockwell-Nordstrom valves. Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

*A registered trade mark of Rockwell Manufacturing Company.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

40th Year *of lubricated plug valve leadership*



Complex manifolding made easy

You can use Rockwell-Nordstrom valves in complex manifolds where ordinary valves wouldn't even begin to fit. Because they have no heavy, bulky bonnet cavities or rising parts, Rockwell-Nordstrom valves take little more space than their flange diameters. Additional advantages: positive shut-off prevents product contamination; firmly seated plug and rugged construction prevent shock load failures that are common to ordinary valves on pulsating flow.

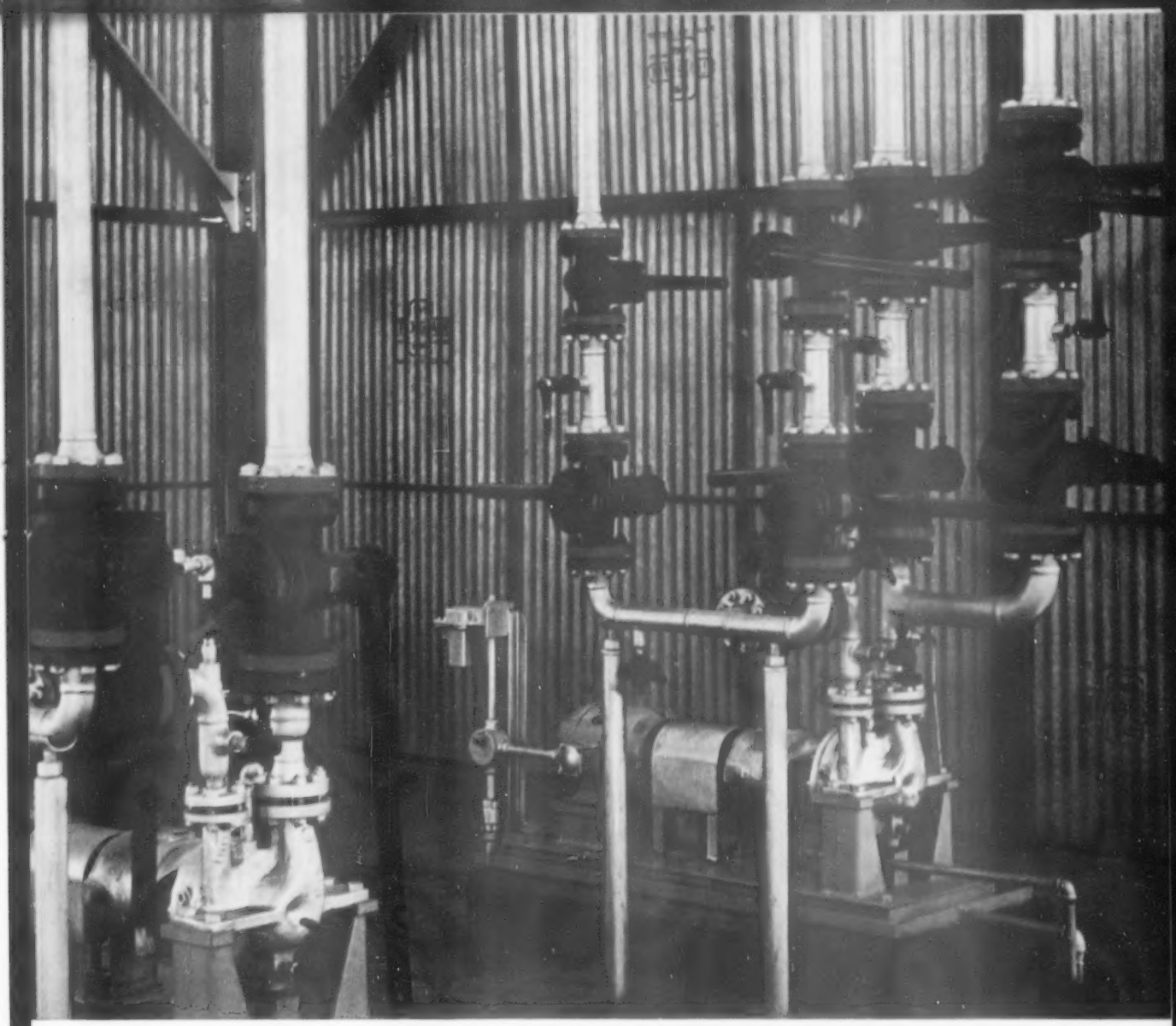
Rockwell-Nordstrom valves cost no more to buy than ordinary valves—and they cost far less to *use*. Available in a complete range of sizes and pressure ratings in semi-steel, steel, stainless and corrosion resisting metals. For details, write: Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

Available at leading suppliers . . everywhere.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed for Positive Shut-off

40th Year
of lubricated plug valve leadership



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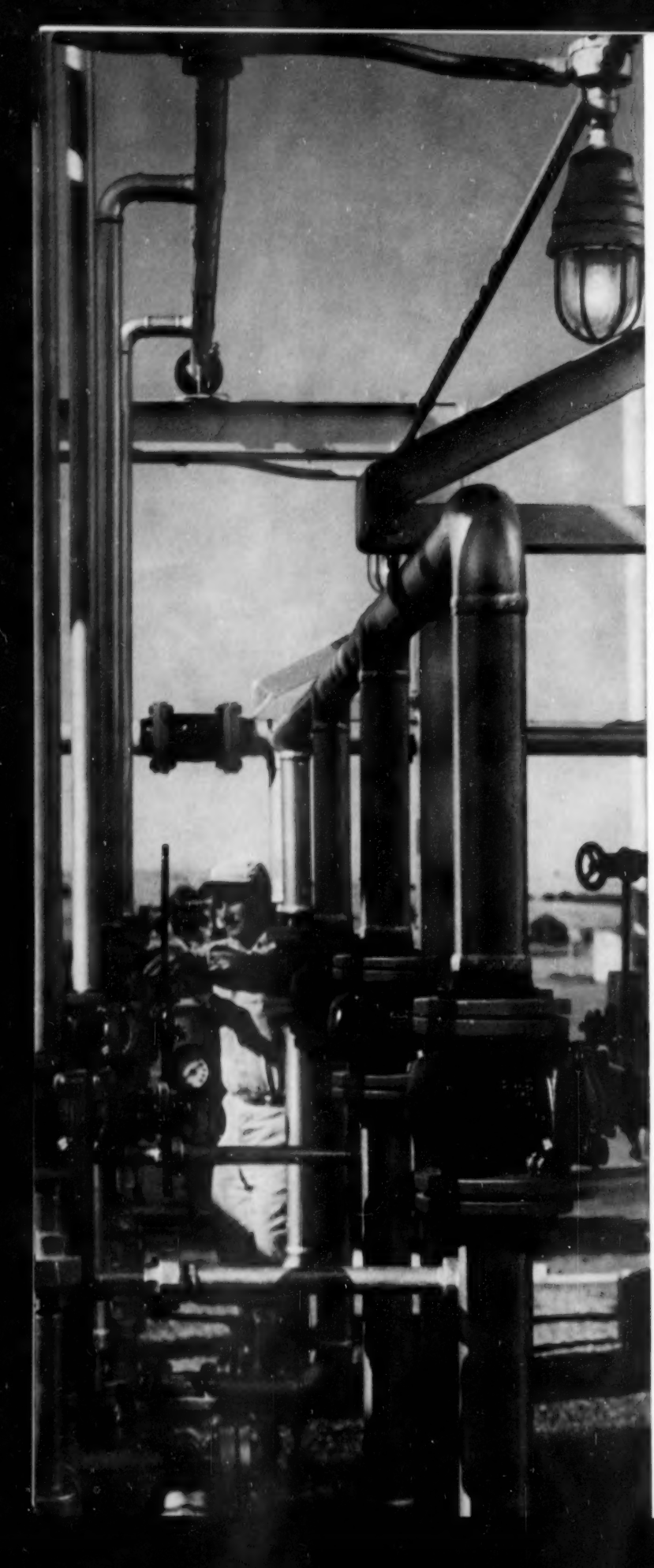

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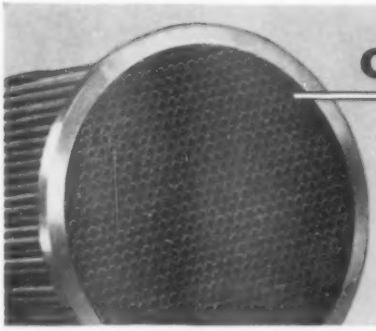
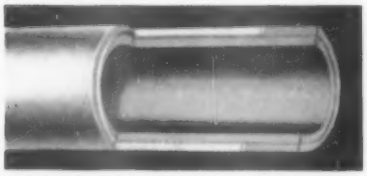
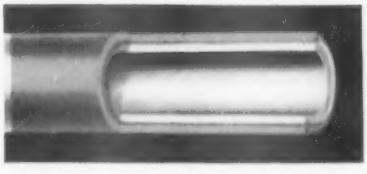


CONDENSER TUBE CLINIC

THE AMERICAN BRASS COMPANY
WATERBURY 20, CONNECTICUT

How two-tubes-in-one can help you solve complex corrosion problems





Edited by James T. Kemp, Metallurgical Engineer

ANACONDA Duplex Heat Exchanger Tubes are for two types of service—where the corroding characteristics of fluids inside and outside the tube are best met with different metals or alloys—where internal or external pressures, or the pressure-temperature combinations, are too great for a nonferrous tube alone. In the latter case, an Anaconda copper alloy with the required corrosion resistance is placed outside or inside a steel tube—and the pair is drawn together. The finished Duplex Tube has the chemical properties required for the more corrosive fluid handled—plus the needed strength.

TWO SEPARATE CORROSION PROBLEMS. A Duplex Tube of steel with copper or a copper alloy inside is used, for example, in exchangers or condensers handling water in the tubes and ammonia or a fluid with appreciable amounts of ammonia in the shell. Moist ammonia attacks copper and all of its alloys, and may cause stress-corrosion cracking. Stresses may be due to applied loads or may be residual from cold working of the metal. Steel, however, is not susceptible to such action by ammonia. Thus the nonferrous tube is shielded and can perform its normal function of giving long service life and efficient heat transfer on the "water side."

Other combinations of coolant—or heating fluid—and "stream" are found in petroleum refineries and chemical plants, in which differing properties are required inside and outside an exchanger tube. Here two nonferrous metals may be combined—a Cupro Nickel and Admiralty, for example.

HEAT TRANSFER. Duplex Tubes have thermal transfer characteristics somewhere between those of the two metals used. Each face of the tube has the receptivity-emissivity of its metal. The metal-to-metal interface is so intimate it offers little resistance to heat flow.

FERRULES. Duplex Tubes can be supplied with ferrules of the same composition as the inner tube (see upper illustration), replacing a short section cut from the end of the outer tube. This ferrule prevents excess corrosion of the ends exposed in the exchanger channel. The ferrule should be long enough to be securely rolled in when the Duplex Tube is expanded into the tube sheet.

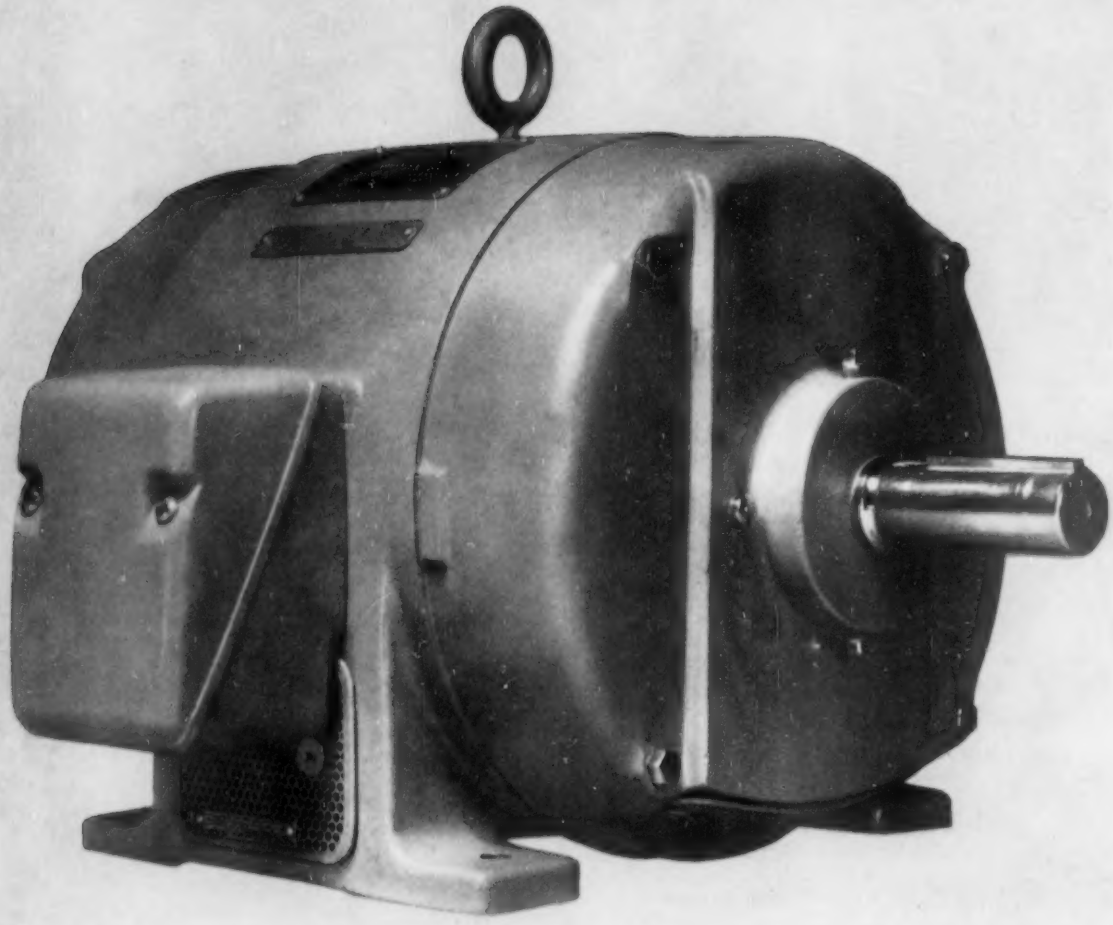
TECHNICAL ASSISTANCE. The American Brass Company's metallurgical engineers and its sales representatives throughout the country are available to help you in the selection of the Anaconda Condenser Tubes to meet your problems. Write: Technical Department, The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6618

ANACONDA®
Tubes and Plates for Condensers and Heat Exchangers

PHYSICAL PROPERTIES OF ANACONDA CONDENSER TUBES*

ALLOY	Tensile Strength, psi	Yield Strength at .5% Elongation Under Load, psi	Elongation in 2", %	Rockwell Hardness, B Scale	Density, Lb. per Cu. In.	Thermal Conductivity, B.T.U./Sq. Ft./In./Hr./°F. at 68° F.	Average Coefficient of Linear Thermal Expansion per °F. (77-572 F.)
Arsenical Admiralty-439	52,000	22,000	60	6-45	0.308	768	.0000112
Ambraloy-927	60,000	27,000	55	35-65	0.301	696	.0000108
Ambraloy-901	60,000	30,000	60	30-60	0.295	552	.0000099
Cupro Nickel, 30%-702	55,000	22,000	50	30-60	0.323	204	.0000090
Cupro-Nickel, 10%-755							
Light Annealed	44,000	22,000	46	25	0.323	314	.0000093
Light Drawn	60,000	57,000	15	68			
Red Brass-24	42,000	15,000	50	0-30	0.316	1104	.0000104
Ambronze-421	46,000	20,000	55	0-30	0.316	830	.0000102
Phosphorized Arsenical Copper-108							
Light Drawn	40,000	35,000	20	20-50	0.323	1344	.0000098
Hard Drawn	54,000	50,000	8	50-70			
Phosphorized Copper-103							
Light Drawn	40,000	35,000	20	20-50	0.323	2364	.0000098
Hard Drawn	54,000	50,000	8	50-70			

*Note: The above values are approximate and should not be used for specification purposes. *Light annealed except as noted.*



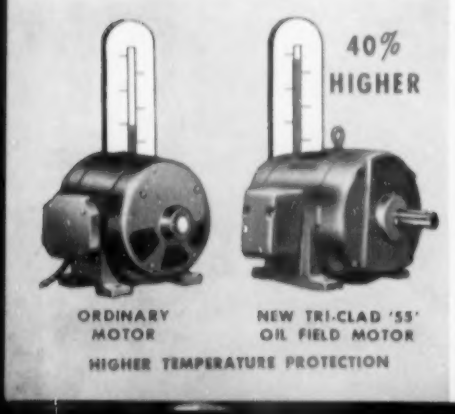
General Electric's NEW

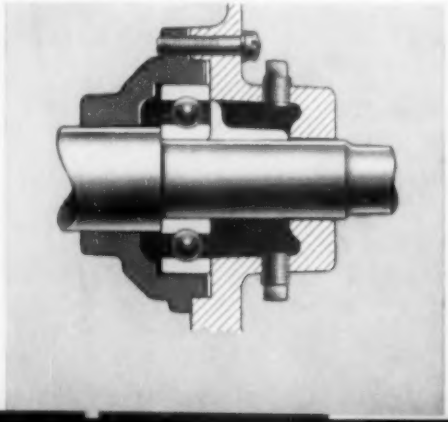
INSTALL IT...

HEAT PROTECTION—Alkanex°, a revolutionary new wire enamel used in the field windings, allows up to 40% higher temperature rise than is possible in ordinary motors, virtually eliminates burnouts.

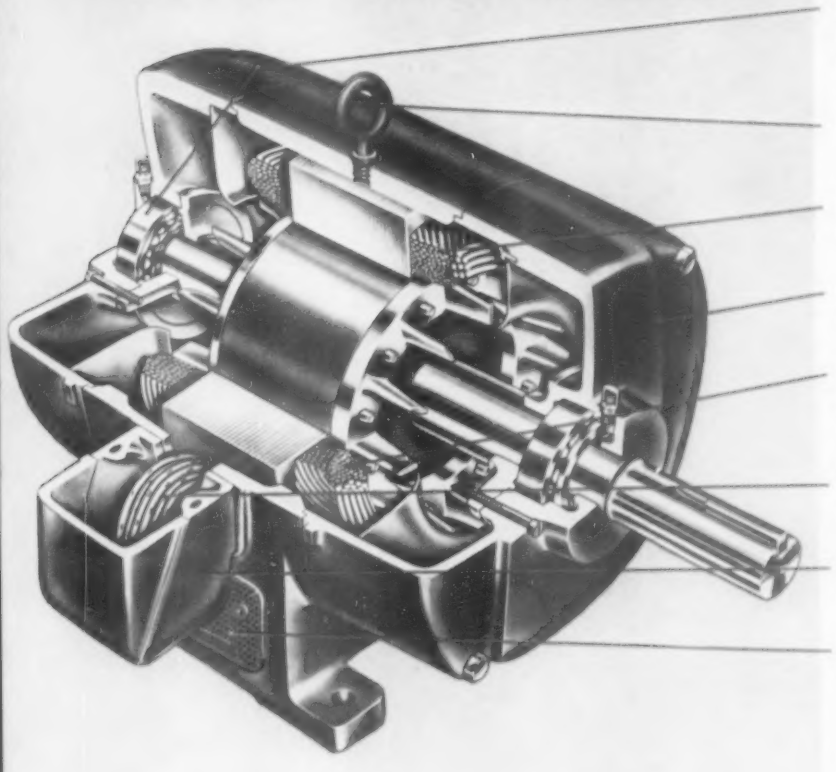
DUST PROTECTION—Closely machined bearing caps and housing on each side of bearings, plus the new G-E Tri-Clad "55" oil field motor's low velocity air intake system, keep dirt and dust out of vital parts, help give added protection for longer, trouble-free operation.

MOISTURE PROTECTION—Field windings, coated with water-shedding silicone Dri-Film*, plus cast-iron frame construction and close fits between all joining surfaces, help prevent motor failure due to moisture.





PACKED WITH MONEY-SAVING FEATURES



1. Advanced bearing system will last longer without regreasing than any other motor bearing system.

2. Convenient eyebolt cuts installation time, —permits easier handling.

3. Water-shedding stator windings virtually eliminate breakdown due to moisture.

4. Rugged cast-iron frame helps prevent corrosion and accidental damage.

5. Class 'B' insulation system with revolutionary Alkanex* wire enamel allows up to 40% higher temperature rise.

6. Perma-numbered leads are easy to read even when taped or clipped.

7. Easy-access conduit box is large and roomy for fast wiring.

8. Removable screens protect motor against damage from rodents and rocks.

*Registered trade mark of General Electric Company

TRI 55 CLAD oil field motor

REG U S PAT OFF

FORGET IT!

General Electric's all-new Tri-Clad "55" oil field motor is specially designed and engineered for long, trouble-free operation on rugged, outdoor pumping applications.

This motor will run far longer without attention than ordinary motors because it is protected against heat, dust and moisture. Burnouts have been virtually eliminated by the use of Class 'B' insulation made from new "miracle" materials Alkanex, heat-resistant enamel wire, and Mylar† mica-glass laminate slot and phase insulation.

The high heat resistance of this new insulation means you get more horsepower per pound in a more compact, cast-iron frame, because it has been possible to reduce ventilation space. The large grease reservoir and revolutionary bearing system has reduced normal maintenance to a few minutes every five years. The eyebolt, large roomy conduit box and perma-numbered leads—"extras" at no extra cost—cut installation time to a minimum.

A new G-E oil field motor on your pumping rig is easily your most economical buy. Install it . . . forget it. For more information write for Bulletin GEA-6546 or contact your nearest General Electric Motor Distributor, or G-E Apparatus Sales Office. 671-1

†DuPont trade mark

MEDIUM INDUCTION MOTOR DEPARTMENT

Schenectady 5, New York

Progress Is Our Most Important Product

GENERAL ELECTRIC

another complete refinery

FOSTER WHEELER

At the Halifax plant of Imperial Oil Limited, Halifax, N. S., a completely new and up-to-date refinery is now "On stream". All the processing units and the utility plant were designed and constructed by Foster Wheeler.

The photograph, shows the following process units, from left to right: 41,600 bbl/day two-stage Crude Distillation unit; 13,000 bbl/day Model IV Fluid Cat Cracking unit; Light Ends Plant; 4,000 bbl/day Catalytic Polymerization unit.

Also included will be a 7,000 bbl/day Powerformer with integral Hydrofiner for feed preparation and a 500 bbl/day LPG unit, scheduled for completion before the end of the year.

FW

To keep supports sturdy where maintenance is most difficult, Monel sheathing was applied to this tender type drilling platform during construction by Brown & Root, Inc., Houston, Texas. It is typical of many such structures built by this company.

In tidal zone...hardest to shield... Monel sheathing gives lasting protection against corrosion

Fast becoming standard on offshore structures

THIS drilling platform shows a practice now rapidly becoming universal among large oil companies.

Monel* nickel-copper alloy sheet tightly wrapped about supporting members to protect them from corrosion in the "tidal and splash zone."

Adoption of the nickel-copper alloy sheathing is based upon its actual, on-the-job performance. And in comparison with that of other materials . . . in the hard-to-shield splash zone where water, air and spray attacks fluctuate, leaving piling sometimes wet, sometimes dry.

Monel nickel-copper alloy resists corrosion by salt water, salt air and salt spray. It withstands wave battering and erosive action as well as abuse from floating debris. And it is easily applied by welding.

Usually, 8 to 12 feet of each vertical support is completely sheathed with 13-gauge Monel alloy sheet. With tops, bottoms and seams welded, it protects supports in the critical zone . . . mean tide level to a few feet above prevailing wave crests. Protects diagonal braces and conductor pipe sleeves where necessary, too.

With Monel alloy sheathing, many oil companies extend life of drilling and tank battery barges, well head protector platforms and loading docks.

This nickel-copper alloy sheathing may help prolong life of *your* new structures or those now in water. If you need help with your problem, write to International Nickel.

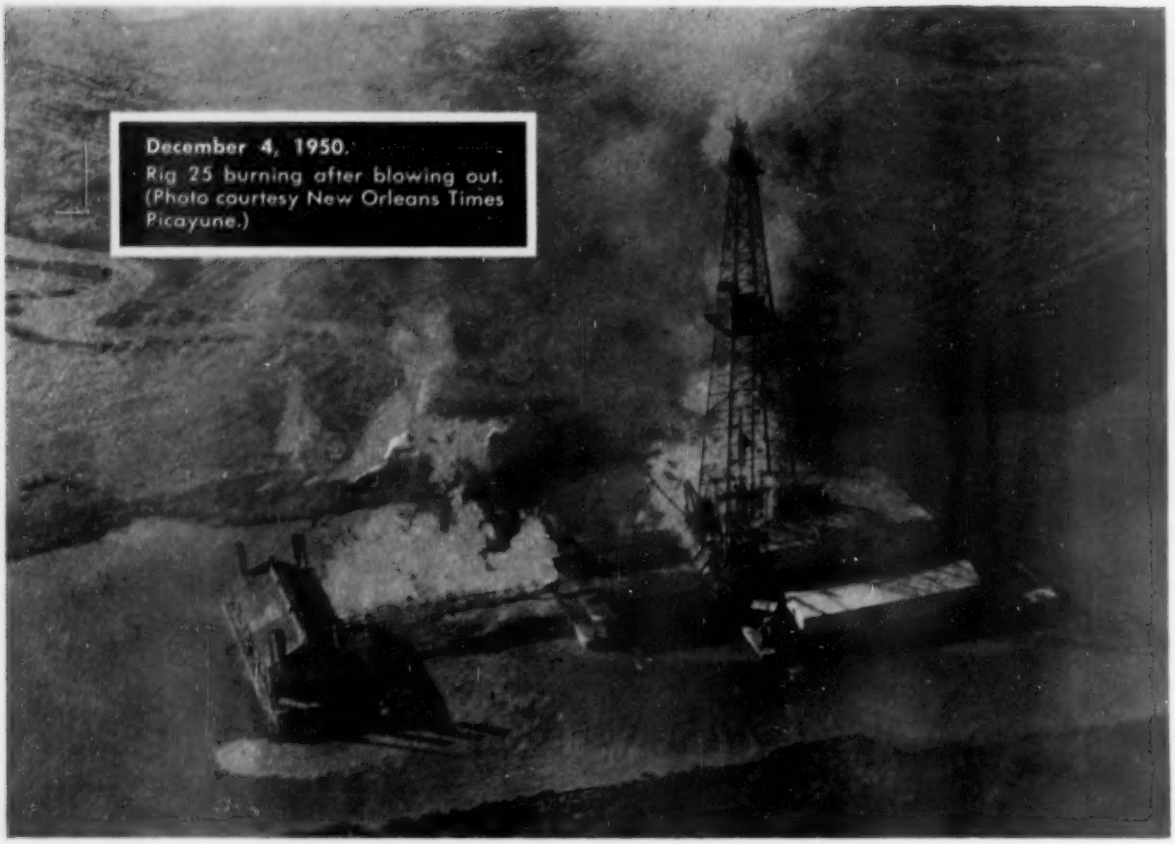
*Registered Trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

100 miles out in the Atlantic, Monel keeps "sea legs" sturdy under the Navy's man-made islands.

INCO Nickel Alloys

Monel... *for minimum maintenance*



December 4, 1950. Rig 25 burning after blowing out. (Photo courtesy New Orleans Times Picayune.)

how this well fire paved the way for drilling the deepest well in the world

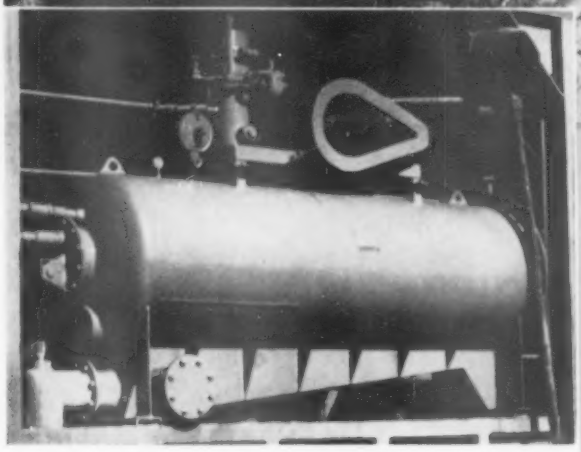
On December 4, 1950, Richardson & Bass' Rig 25 was drilling at 11,682 feet in the marshes of South Louisiana when the well blew out. The rig caught fire and was very badly burned. This fire pointed out the desirability of an effective way to remove gas from drilling fluids, and the first experimental model of the SWACO D-Gasser was installed on rebuilt Rig 25 on May 17, 1951.

The D-Gasser marked the beginning of a new era in safety for operators in high pressure areas. Since 1951, Rig 25 has drilled many marshland wells without fire or blowout. While much credit for this performance must go to Richardson & Bass equipment, drilling personnel, and mud engineers, the D-Gasser certainly played a vital part.

SWACO D-Gassers are now standard equipment on all Richardson & Bass Gulf Coast rigs as well as many rigs of other Gulf Coast operators.

By removing all the gas from all the mud as it is circulated, SWACO D-Gassers have prevented many blowouts and fires. Some leading operators have said that D-Gassers have made possible the drilling of many wells that could not have been drilled otherwise.

December 7, 1955.
Rig 25, rebuilt after the fire reaches 22,559. (During reaming, the hole was deepened to 22,570 feet.)



This SWACO Mud D-Gasser is installed on Rig 25. It was inspired by the 1950 fire and was given much credit for helping keep the deep well under control.

HERE'S HOW THE SWACO D-GASSER HELPED IN DRILLING THE WORLD'S DEEPEST WELLS

- Saved hundreds of thousands of dollars in mud costs.
- Saved untold hours of rig time that would have been lost while building up mud weight.
- Permitted the reasonably safe use of over 16 lb. mud for over two months while drilling in treacherous open hole from 13,656' to 19,752'.
- Made it possible to tolerate continuous gas-cutting from about 13,656' to bottom. This allowed the use of drilling mud on the lighter side of the mud balance to avoid lost circulation and sure loss of hole.

THE DEEP HOLE

The SWACO D-Gasser played an important part in drilling the deepest well in the world which was recently made into the deepest producer. This well is an outstanding example of how the D-Gasser can save holes as well as time and money.

J. E. Hill, General Manager for Richardson & Bass, said the record would never have been attempted without the D-Gasser. Actual experience proved the soundness of this judgment.

At a number of points before reaching 19,572 feet, mud was gas-cut from 17.9 to 13 lbs. per gallon and lower. This could easily have been a major emergency without the D-Gasser because it would have been nearly impossible to control the mud within the

narrow range of weights required. In most instances, the difference between blowout and lost circulation was only three-tenths of a pound per gallon.

THE BIG TEST

The big test, however, came just as the hole was at 21,463 feet, when 18 lb. mud was severely gas-cut to 11.9 lbs. per gallon. The D-Gasser continuously restored the mud to its original gas-free weight.

Two considerations made it imperative to avoid weighting the mud any more than necessary.

First, it was difficult to maintain the lime base mud under the high temperatures being encountered. Adding weight material would have compounded the difficulty.

Second, it was essential to avoid any possibility of lost circulation because, at this depth, lost circulation would have meant almost certain loss of the hole.

With the D-Gasser, it was possible to tolerate gas-cutting continuously from the bottom of the 9⅝" protection string at 13,656 feet, to T. D. at 22,570 feet. This permitted holding the mud weight only slightly above the indicated bottom hole pressure encountered as drilling progressed. If the D-Gasser had not been available, this would not have been possible, and the chances of losing the hole due to lost circulation would have increased enormously.

HOW THE D-GASSER CUT COSTS

The total drilling mud bill was $630,811.95. Since there was no control well for comparison it is impossible to tell just how much the D-Gasser saved in mud costs.

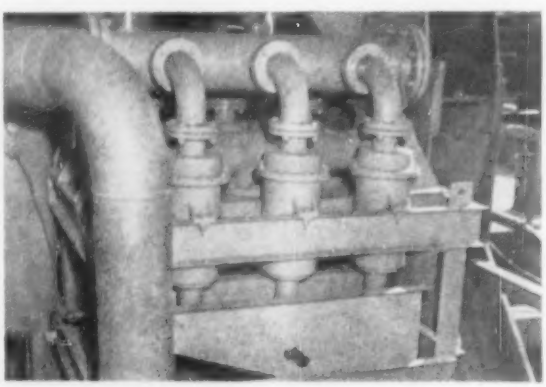
However, over 1,000 wells have been drilled using the D-Gasser and many reasonably accurate comparisons have been made.

Based on this experience, it can safely be said that the mud bill without the D-Gasser might have been more than one million dollars—*if the well could have been drilled at all.*

Based on the same experience, it is certain that the D-Gasser saved many hours of rig time.

Richardson & Bass has not lost a rig due to blowout or well fire since SWACO D-Gassers have been installed. Savings in mud costs and drilling time alone have been enough to pay the entire cost of the D-Gasser many times over.

SWACO D-Gassers are rapidly becoming accepted as standard equipment for Gulf Coast and offshore rigs, as well as rigs operating in other high pressure areas. If you are drilling in such an area and are not using the D-Gasser, write us. It is possible that it can save your money as well as protect your rig investment.



The DORRCO D-SANDER effectively removes sand and drilled solids from the drilling fluid. Extensive field experience has proved that it speeds drilling, reduces pump maintenence costs, and offers many other important benefits. A D-Sander is installed on Rig 25 to reduce the cost of drilling through the sands that predominate in South Louisiana above 9,000 feet. For full information on this outstanding piece of equipment, call or write us.

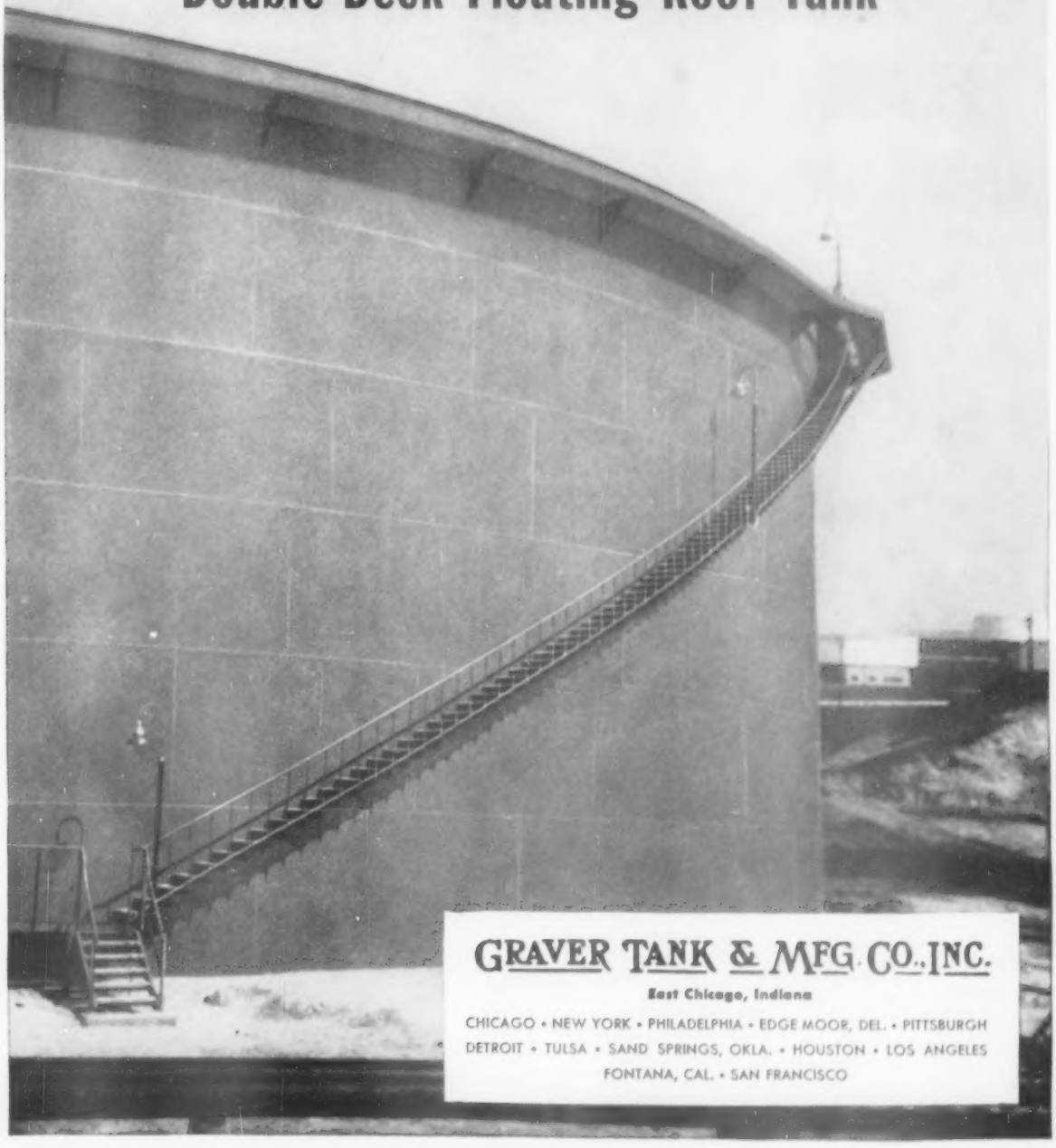
SWACO

SALT WATER CONTROL Inc.

A Sid Richardson Development Company

1211 Ft. Worth National Bank Phone: ED 2-4434 Ft. Worth, Texas

SERVICE-PROVED
...for effective control of vapor losses
the GRAVER®
Double-Deck Floating Roof Tank



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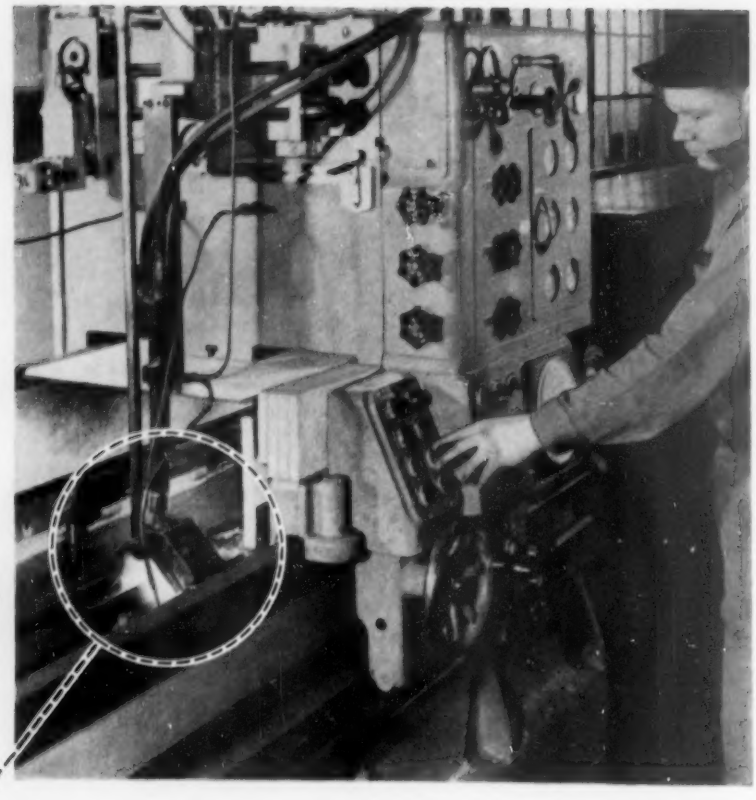
HIGH SPEED FLAME-HARDENING



Cross-section view shows uniform depth of hardened surface.

SPECIAL MACHINE UPS LIFE OF GRAPHITIC STEEL PARTS

LINDE engineers have assisted Cincinnati Steel Treating Company in developing a flame hardening machine which increases service life of 16 ft. long, graphitic carbon steel lathe ways . . . Development of this automatic, high speed machine is another example of how LINDE Service Engineers are helping LINDE's customers up production speed and unit quality through co-operative research engineering.

With this new machine, a lathe way to be treated is placed on a magnetic chuck in a water filled channel. Flame-hardening heads and control mechanism move at predetermined speeds along the part. After it cools, the lathe way is placed in a refrigerator for 24 hours which stabilizes the steel, and brings its case hardness to a minimum of 60 Rockwell "C" scale.

The benefits of LINDE's research, engineering, and over 40 years of accumulated know-how stand behind each of its customers to help them solve production problems. Get these "plus-values" which LINDE offers—it pays you to do business with LINDE.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

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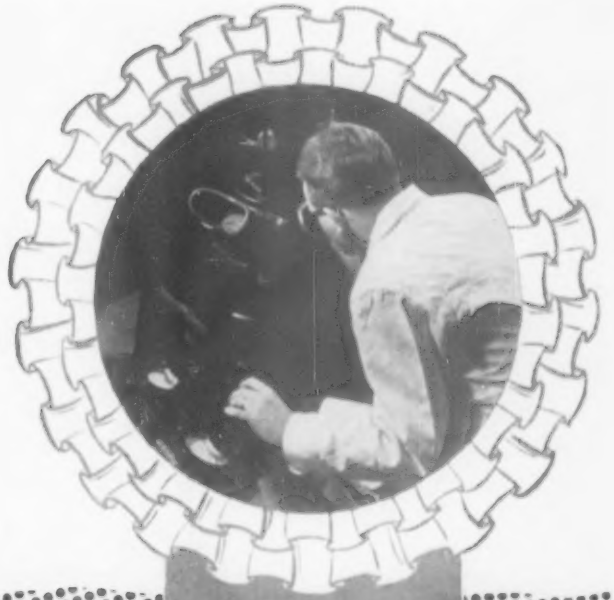
Linde
Trade-Mark

ON STRIVING FOR PERFECTION



50 YEARS OF RESEARCH AND ACHIEVEMENT IN INSULATION

From long experience in industrial insulation Newalls have developed modern techniques to meet the special needs of Oil Refinery and Petro-Chemical plants erected abroad.

In step with field activities, Newalls Research Laboratories have striven constantly for higher standards in insulation practice.

Newalls ranges of insulants for SINGLE or DOUBLE LAYER application meet temperatures from −300 F up to over 2,000 F. They include Newalls (Reg'd Brand) 85% Magnesia, Nicosil, Newtempheit, and Amosite Asbestos, which are carefully controlled at every point of manufacture and are designed to maintain their initial standard of service throughout the life of the plant.

LEADERS IN REFINERY INSULATION ▶

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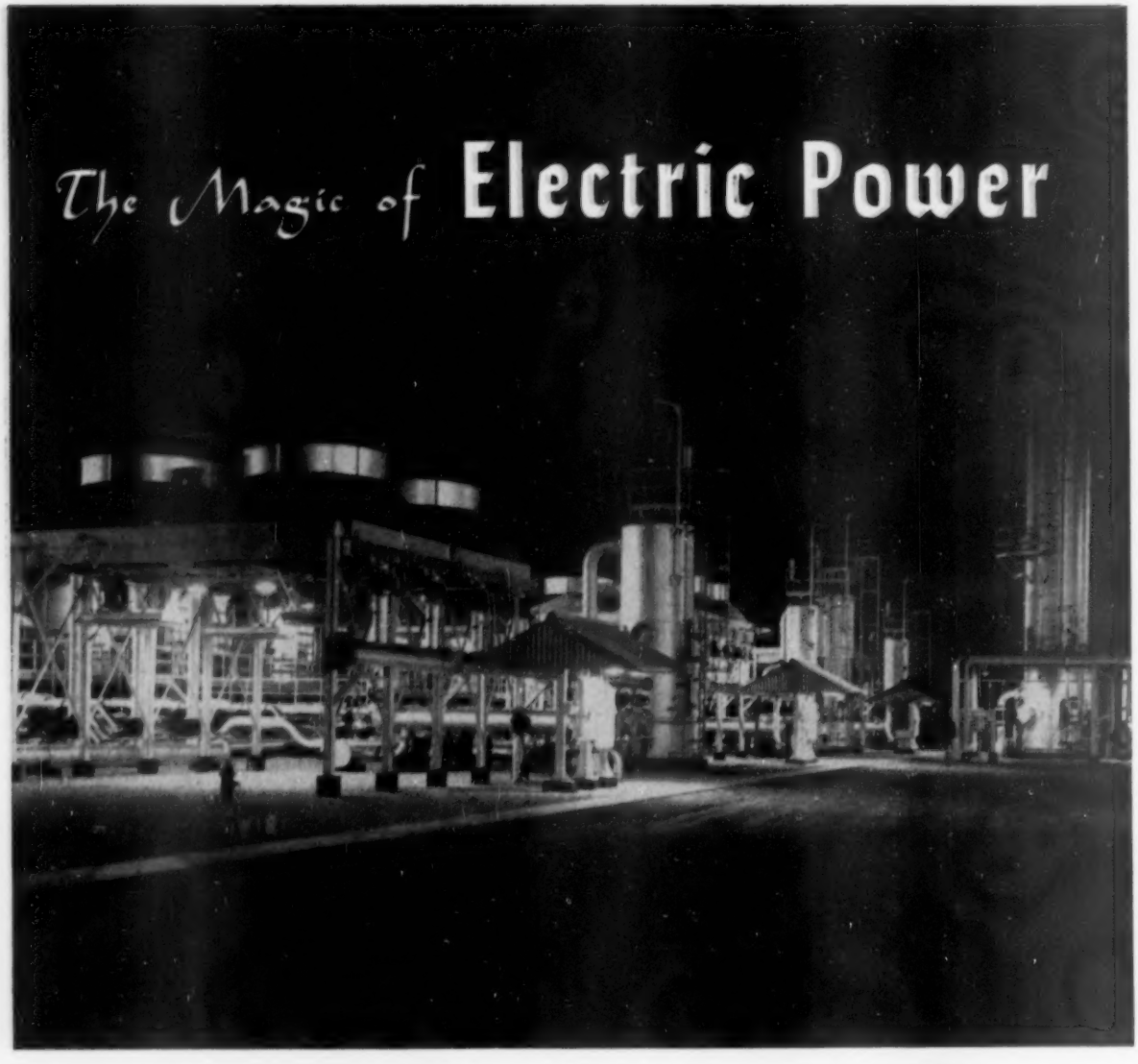
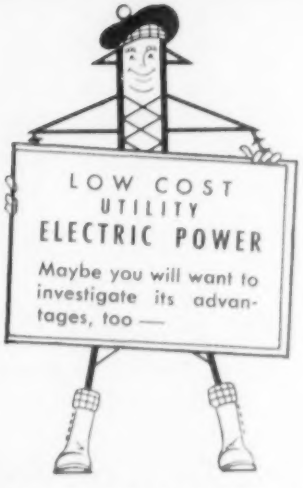
Agents and vendors in most markets abroad.



Service... Dependable Service

Next to a captivating sunset nothing has such a magical appearance as a giant refinery flooded by the grandeur of electric light on a pitch dark night.

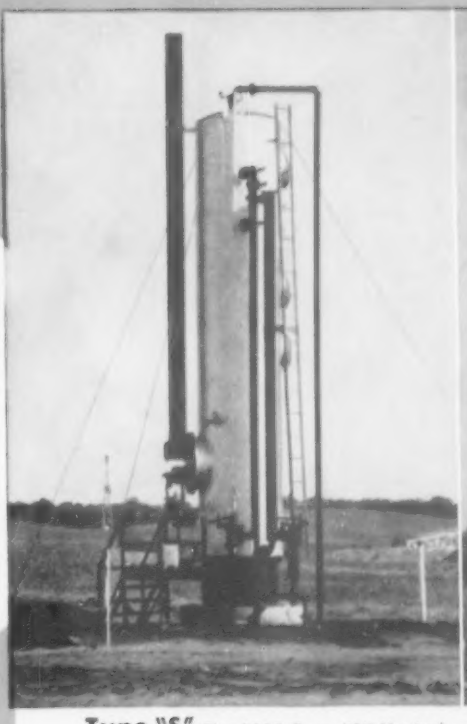
Spectators view it with unceasing awe — Businessmen view it as a well-lighted, efficiently powered investment. Over 72 per cent of this nation's refineries utilize dependable purchased Electric Power. More cost conscious men are specifying it every year.



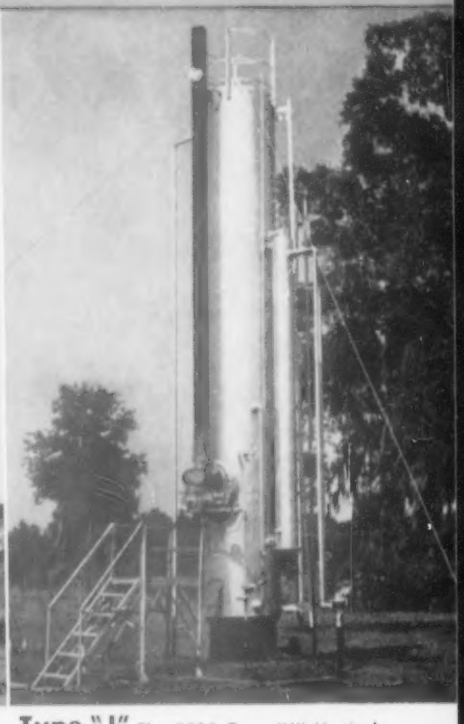
WRITE PETROLEUM ELECTRIC POWER ASSOCIATION, P. O. BOX 2771, DALLAS, TEXAS, OR CALL THE SALES ENGINEER OF YOUR LOCAL UTILITY ELECTRIC POWER COMPANY — NOW

For *Average* or *Tough* Treating Jobs...

BS&B
Treaters Get The Job Done ...Right!



Type "S" The BS&B Type "S" Vertical Treater is a well balanced unit with excellent performance characteristics for low cost treating under average conditions. Available in sizes to treat 100 to 2500 bbls. of oil per day.



Type "J" The BS&B Type "J" Vertical Treater is a high performance level unit designed to handle large volumes of oil, water and gas on "tough" treating jobs. Available in sizes to treat 100 to 3600 bbls. of oil per day.

Model "HGT" Where a Horizontal Treater is indicated because of large volume requirements, broader distribution of weight on marshy ground, wind loading and anchoring conditions, etc. we strongly recommend the BS&B Model "HGT"." This treater will handle even the "toughest" treating jobs under the most adverse conditions. Available in sizes to treat 100 to 16,000 bbls. of oil per day.

Some makes and types of treaters operate at much higher efficiency than others under a given set of operating conditions. Some require a lot of expensive "down time" for maintenance and repairs. But lease operators of *experience* know that when they buy a BS&B Treater, they need have no concern on either count.

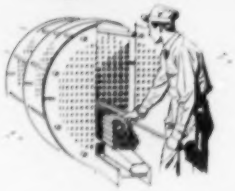
No matter how "average" or how "tough" the operating conditions on *your* lease, there's a right size and type of BS&B Treater for the job *you* have to do! BS&B Treaters are famous throughout the industry for their optimum operating results at lowest operating cost.

Don't be "shortchanged" by operating any treater on your lease that fails to deliver *maximum return per dollar invested!* Your BS&B Man will be glad to assist you in selecting the best treater for *your* conditions.

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A9
P.O. Box 1714 Oklahoma City, Oklahoma

Only Republic Heat Exchanger Tubes



. . . *the nondestructive*

This electronic method of spotting any irregularities in welded tubing is the last word in nondestructive tests for heat exchanger and condenser tubes.

Now available on the production line, it can be specified instead of your present method *at no extra cost.*

FARROWTEST works like this. The tube to be checked is run through a group of test coils. If the tube is uniform, the signal from the coils remains constant. If an injurious defect in the tube wall shows up, the tube is automatically stopped, marked and diverted to the reject rack.

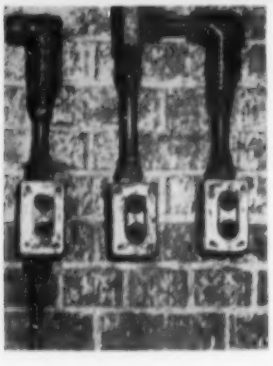
FARROWTEST is extremely desirable where applications require testing beyond the normal nondestructive types—where the ultimate in safety is absolutely essential. Such as applications where human life must be protected. Or expensive equipment. Or costly products.

Actually, FARROWTEST has served to prove the outstanding quality of Republic ELECTRUNITE Tubing since 1939. More than two hundred million feet of Farrowtested tubing has been successfully used in the field to prove its adequacy for shell-and tube-type equipment as well as for even more severe and critical applications.

Republic ELECTRUNITE Tubing for heat exchangers and condensers is made by the Electric Resistance Weld Process—is known for its uniform strength, uniform wall thickness, uniform ductility. Add FARROWTEST to these advantages and you have assurance that the tubing you use will give you many years of trouble-free service.

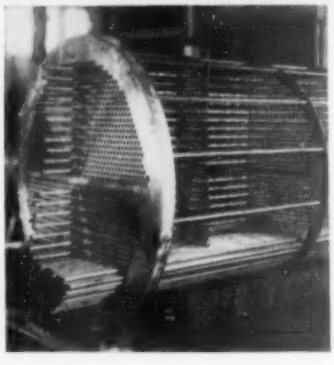
So, when you place your next order for heat exchanger or condenser tubes, either carbon or stainless, specify FARROWTEST. *Remember, only Republic Steel offers you this nondestructive electronic test.* Send coupon for literature giving complete specifications.

These Republic products provide



DEKORON®-COATED ELECTRICAL METALLIC TUBING is the ideal raceway where severe corrosion is a problem. You actually get double protection—a plastic armor of polyethylene extruded over zinc-coated steel. Fittings and couplings are easily protected with plastic or vinyl tape. Runs are protected from end to end. The switchgear above has been replaced four times in 15 months. The Republic Dekoron-Coated E.M.T. is undamaged in same period and still going strong.

STAINLESS STEEL PRESSURE TUBES are a big item with Republic, the world's largest producer of stainless and alloy steels. Made of finest Republic ENDURO® Stainless, these ELECTRUNITE Heat Exchanger Tubes are uniform in diameter and wall thickness. Tubes slide easily and quickly through holes in drums or headers. Result: lower installation costs, greater dependability.



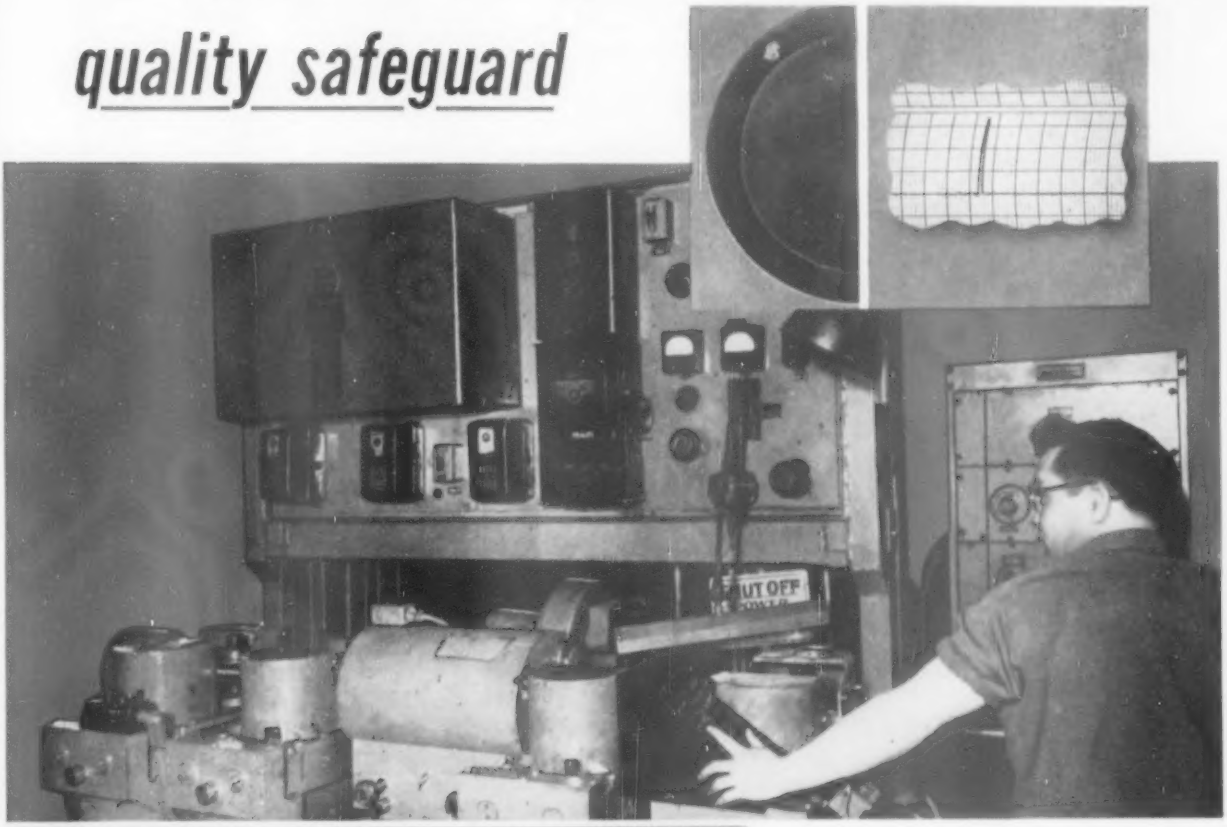
REPUBLIC

REPUBLIC STEEL

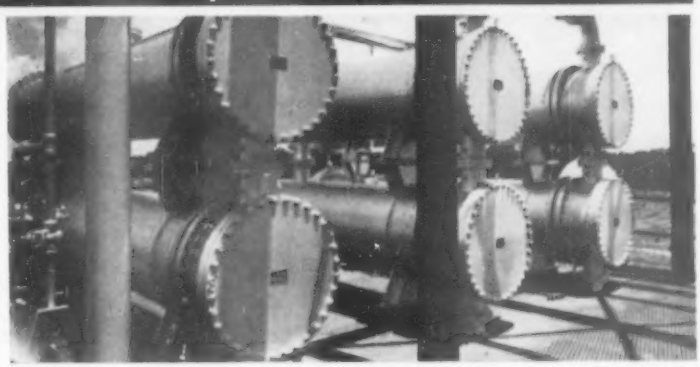
World's Widest Range of Standard Steels

are protected by FARROWTEST®

quality safeguard



built-in protection



The FARROWTEST equipment automatically stopped when the defect shown in the macrograph (top center) passed through the detector coils. This defect was charted on the Oscillograph tape shown at top right.

TOUGH, ALLOY STUDS are a familiar sight on heat exchangers. Wherever high temperatures and pressures exist, Republic Alloy Steel Studs are called upon to do a job because they're dependable—even under extreme conditions. Sharp, accurate threads provide maximum holding power, resistance to wear, trouble-free backoff for maintenance. Order Republic Alloy Studs from your distributor—for new equipment or replacement.

STEEL

and Steel Products

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Please send me more information on:

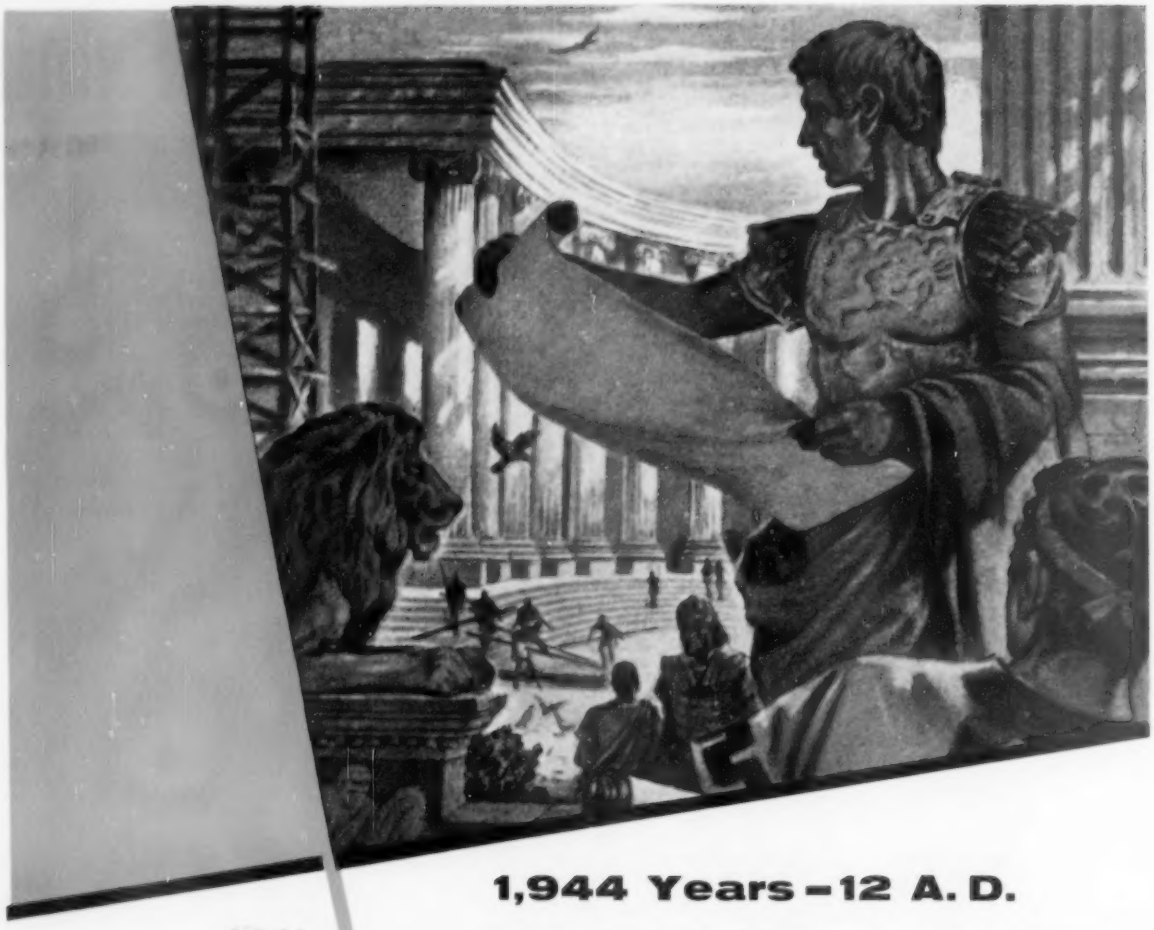
- ☐ FARROWTEST
- ☐ Dekoron-Coated E.M.T.
- ☐ ELECTRUNITE Carbon Steel Heat Exchanger Tubes
- ☐ ELECTRUNITE Stainless Steel Heat Exchanger Tubes
- ☐ Alloy Studs

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____



1,944 Years – 12 A. D.

Nineteen hundred and forty-four years ago the Roman Empire was at its height, glorying in the Golden Age of Augustus Caesar, Emperor and Builder. This is a long span of years, yet it parallels the combined service record of the officers and supervisory personnel of the Texas Employers' Insurance Association . . . 1,944 years.

This does not include the years of service and experience of the members of the board of directors or the non-supervisory employees who help to provide the Workmen's Compensation Insurance SERVICE and make possible the SAVINGS that have made the Association so popular with employers of labor in Texas.

Many members of the Oil and Gas Industry are taking advantage of this SERVICE and these SAVINGS. Are YOU?

Over
$46,000,000
Saved and Returned to
POLICYHOLDERS

A. F. ALLEN, *President*

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INSURANCE ASSOCIATION
HOME OFFICE • DALLAS, TEXAS
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WORTHINGTON CORPORATION

BUFFALO, NEW YORK

OFFICE OF THE VICE PRESIDENT

TO: Natural Gas Pipeline Industry

SUBJECT: Worthington's TURBO-UNIFLO SUTC Gas Engine Compressor

Every once in a while a major improvement in gas transmission equipment comes along. The UTC engine compressor, introduced in 1949, was such a development. Designed for smoother running and cooler burning, it had a new and novel uniflow scavenging system which promised to drastically cut fuel and maintenance costs.

The UNIFLO 2-cycle engine won immediate acceptance. One of the "penalties of leadership," however, was the need for related design improvements to keep pace with its advanced scavenging system. These changes have all been applied.

It is out of such pioneering work that great strides are made in the search for more reliable, more economical, progressive pipeline equipment. In addition to the changes you now find in the standard UTC design, our engineers added turbocharging. Unlike ordinary 2-cycle supercharged gas engines, Worthington turbocharging requires no power-draining extra drive from start-up through full load. Successful performance is now proved by over two years of field operating experience on pipeline service.

Extensive research and conclusive shop and field testing of the TURBO-UNIFLO SUTC, as we call our current design, have resulted in improved fuel consumption, greater load flexibility, and lower noise level.

With its uniflow scavenging system, the turbocharged SUTC represents a great advance in compressor station equipment ... one which contributes substantially to reduced cost of pipeline station operation.

Believing that you will want to review the features of the SUTC, we have made a very complete technical bulletin available. You can obtain your copy by requesting S-550-B23D from Section E65, Worthington Corporation, Harrison, N.J.

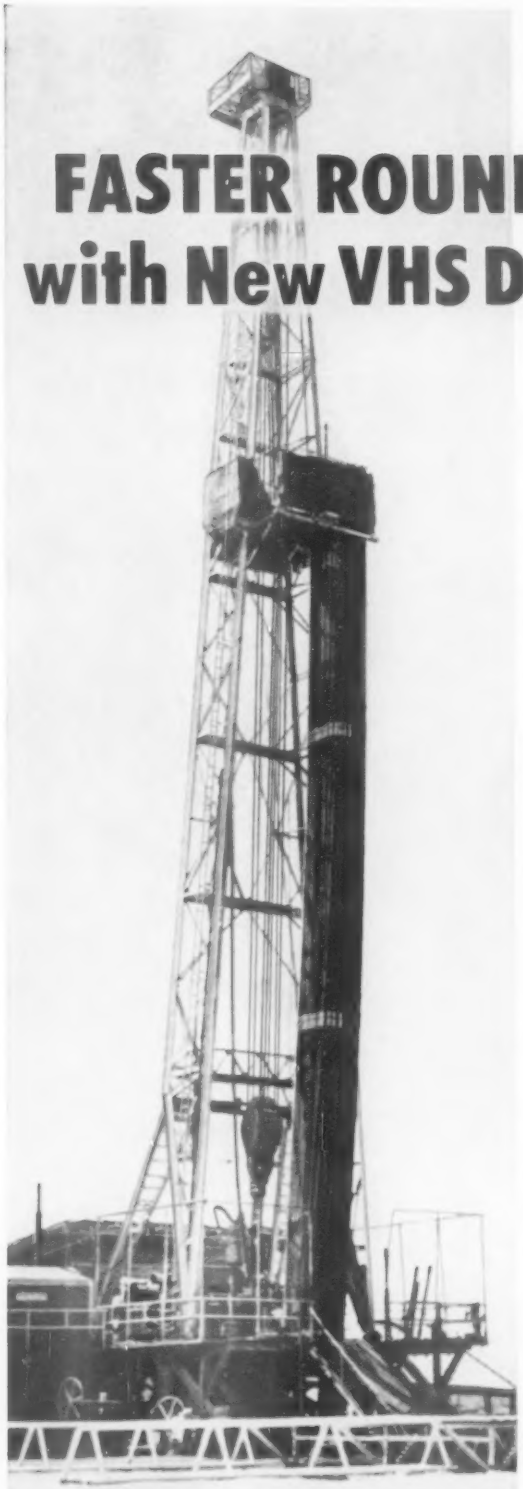
Any comments would prove of great interest and value to us.

Austin C. Ross

Austin C. Ross, Vice President and General Manager
Compressor and Engine Division

P.S. The SUTC is ideally suited for refinery and process work, too, because of its great flexibility over a wide range of loads, speeds, and variable capacities. The bulletin referred to above also covers these applications.

FASTER ROUND TRIPS with New VHS Drilling Lines



• Faster round trips are just one of the advantages you get with rotary drilling lines of new LAY-SET VHS. Made of a new grade of steel for wire rope, new VHS is at least 15% stronger than Improved Plow Steel—the strongest available before VHS.

DRILL DEEPER

This extra strength allows you to drill deeper before increasing the number of parts of line. You can make faster round trips. And the extra strength of new LAY-SET VHS eliminates, in many cases, the necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factors.

HIGHER SAFETY FACTOR

10 lines of new LAY-SET VHS have a safety factor of 14.9 or 15% higher than 10 lines of IPS. In fact, the safety factor for 10 lines of VHS is equal to that for 12 lines of IPS.

RESISTS ABRASION, PEENING

New VHS is also tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

WINCH LINES, TOO

Now winch lines of stronger, tougher VHS are also available. Call your Hazard distributor for rotary drilling lines or winch lines of new LAY-SET VHS. You don't need any complicated specifications—just tell him the size and diameter you want.

for further information write to the nearest Hazard office for Brochure DH-522

LAY-SET VHS

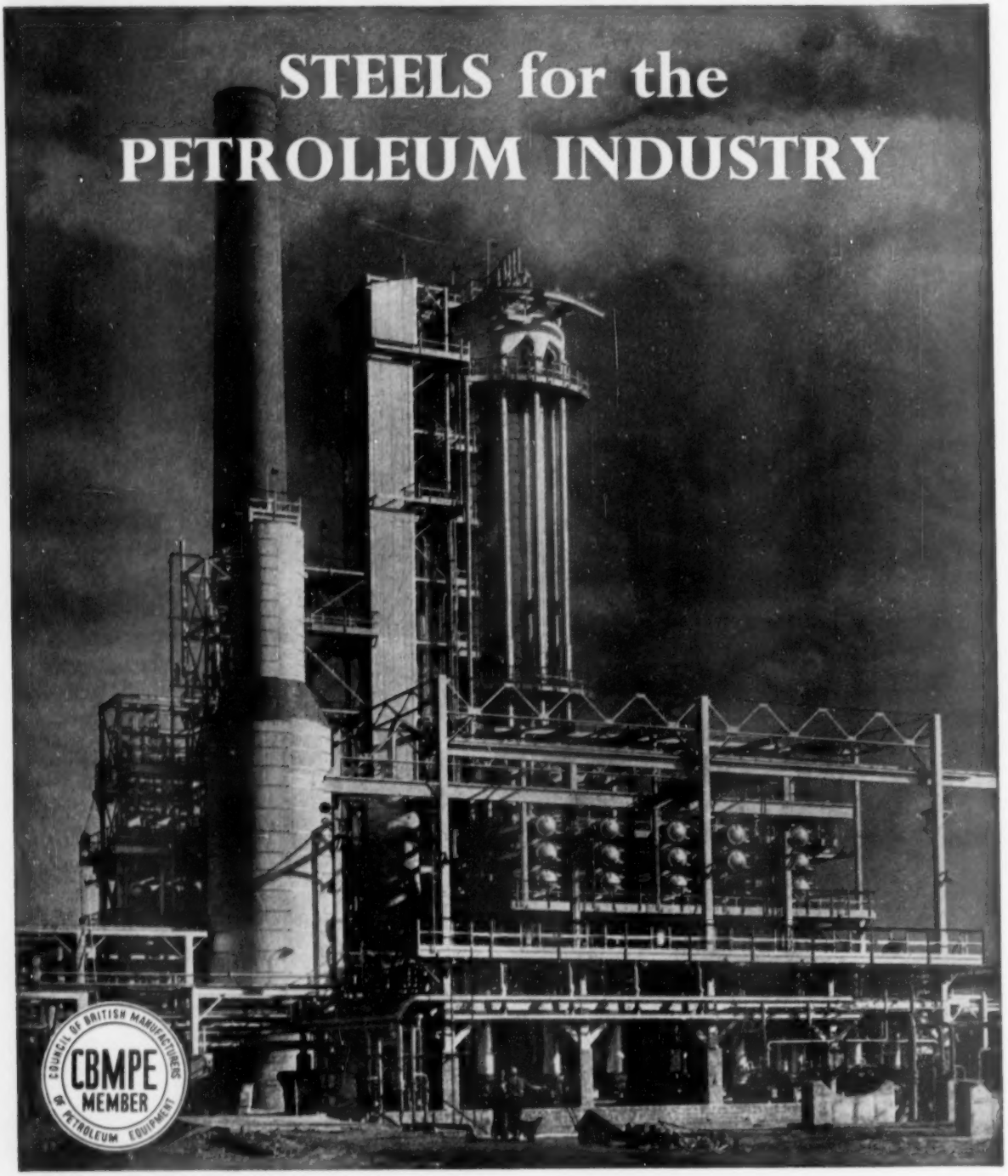
15% Stronger • Tougher •

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

630 McFarland St. Houston 1, Texas | 4555 E. 46th Ave. Denver 16, Colorado | 2216 S. Garfield Ave. Los Angeles 22, Calif. | 400 W. Madison St. Chicago 6, Ill.

Wilkes-Barre, Pa.; Odessa, Texas; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND



"A Symphony in Steel"—A British Petroleum Company photograph.

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND

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US 106

DOW

ELIMINATE OIL FIELD HAZARDS

practice good housekeeping with Dow weed and brush killers

Brush and weeds don't belong in vital oil areas. Whether they're a fire hazard, unsightly, a safety problem, or just a nagging nuisance, eliminate them with Dow brush, weed and grass killers.

Radapon*, containing dalapon sodium salt, gives you season-long control of grasses. For extended control of both grasses and broad-leaf weeds use Baron®. Both of these systemic killers act through the leaves . . . down through the plant system . . . right into the roots.

Dow brush killers keep your above-ground pipelines visible . . . accessible . . . making patrol and maintenance easier. A wide variety of specialized brush killers offers you positive control of local species.

You can plan a complete vegetation-control program at low cost with Dow specialized herbicides. We'll be glad to help you work out a program to fit your needs. THE DOW CHEMICAL COMPANY, Agricultural Chemical Sales Department, Midland, Michigan.

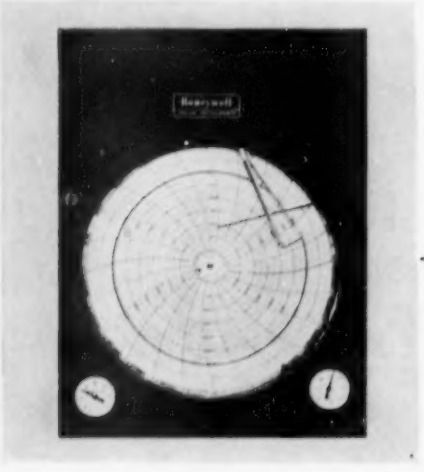
*Trademark of The Dow Chemical Company

you can depend on DOW AGRICULTURAL CHEMICALS

DOW

A typical Honeywell water flooding control system.

Brown Flow Controller

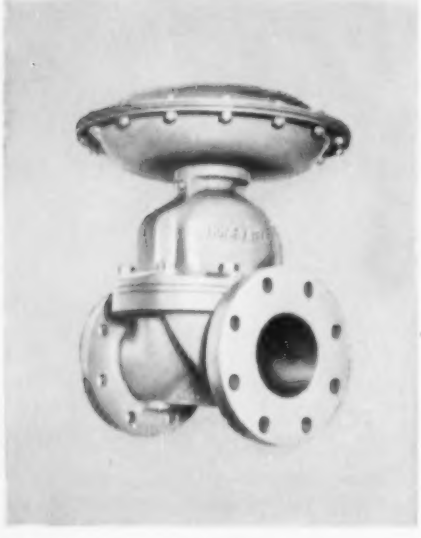


Has sensitive on-off control, and can be equipped with interchangeable proportional control units to compensate for load changes.

ElectroniK pH Controller

Operates on the inherently accurate null-balance principle, using the Brown "Continuous Balance" unit to give stepless, continuous and accurate control.

Saunders Type Valve

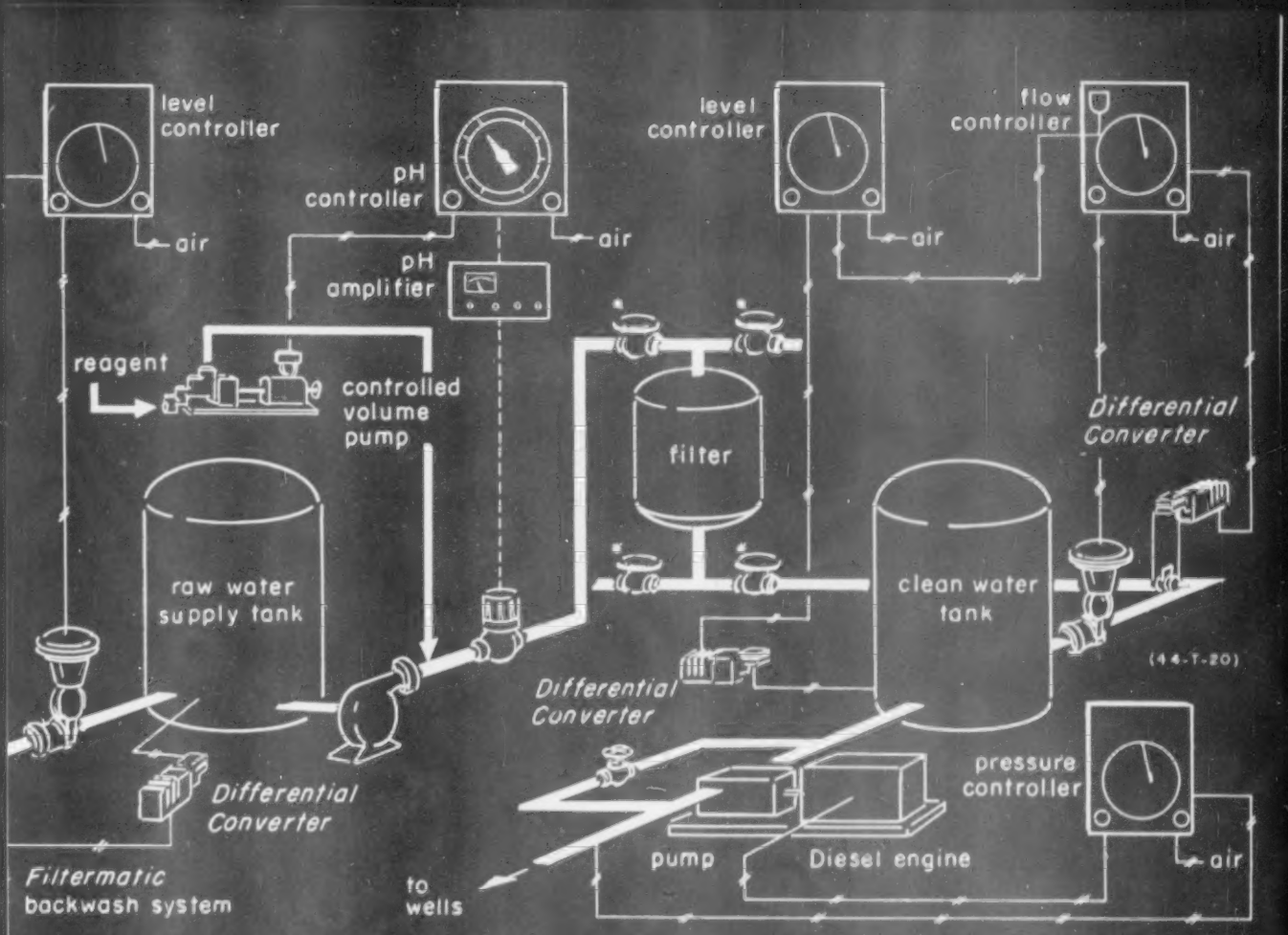


This close-coupled valve is ideal for use where control requirements are not highly critical and where the reagent is viscous or contains solids. Available with glass or rubber lining, in sizes ½" through 4".

control any

Differential Converter Transmitter

Highly responsive to rapid changes in flow, and has continuously adjustable span requiring no change of parts over a 10-to-1 range.



water flooding system...

with Honeywell instrumentation

WHATEVER your instrumentation requirements for secondary recovery systems, Honeywell can meet them . . . with outstanding instruments and truly complete service. From this single source you can, conveniently and economically, select the proper instruments to indicate, record or control all variables in the gathering, conditioning, and injection phases of water flooding.

You can confidently count on Honeywell for planning, installation and maintenance of your water flooding control system. A call to any of the more than 100 Honeywell branch offices will bring prompt help from factory-trained specialists at startup, during installation, or in emergencies.

Your nearby Honeywell sales engineer will be glad to give you the facts on water flooding instrumentation and the thorough service that comes with it. Give him a call today . . . he's as near as your phone.

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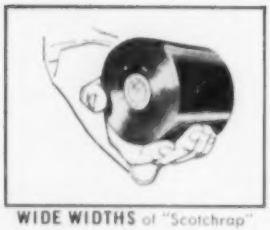
BROWN INSTRUMENTS
First in Controls

"SCOTCHRAP" raises pipe-to-soil potential

Wondering what to do about a low pipe-to-soil potential? Better think about "Scotchrap" Pipe Insulation Tape. It may be the easy way to solve the problem—at the lowest possible cost in the long run.

For example, engineers of a major pipeline company recently checked the pipe-to-soil potential at each valve setting on a 30-inch main. Average reading: 0.65-0.75. Two new rectifiers at the worst trouble spots would cost $4000.



WIDE WIDTHS of "Scotchrap" give fast coverage.

They decided to put "Scotchrap" Brand Pipe Insulation Tape to work instead. They wrapped 4 feet of the 30-inch line at every valve—two feet above the ground, two feet below. They also wrapped about 20 feet of bare line where the coating crew had stopped short.

The result? Pipe-to-soil readings in the most troublesome areas now average 0.80-1.1 volts with the same rectifier capacity. *Net saving: $1500!*

Try "Scotchrap"! See for yourself! Write for free booklet " 'Scotch' Brand Products for Pipeline Protection" Dept. EU-96.

Reg. U.S. Pat. Off.

SCOTCHRAP Pipe Insulation Tape

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PRODUCT OF 3M RESEARCH

The term "Scotchrap" is a registered trademark of Minnesota Mining and Manufacturing Company. St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

3M COMPANY

They Say—

No Dissension in the Ranks

Dear Sir:

For the record, I am told that the quotation attributed to "a group of independent oil men in Amarillo" which appears in your story about price cuts on page 92 of the August 13 issue of The Oil and Gas Journal is incorrect.

In the absence of the Panhandle Producers and Royalty Owners president, officials of that association—including the executive secretary—drafted a statement immediately following the crude price cut in the Panhandle area. Your article quotes this group as saying in part:

"The cut in Panhandle oil is not justified. The cut in West Central Texas crude oil was made because of its inferior quality, but no such condition exists in the Panhandle."

We are advised that the exact quotations authorized by these folks . . . read as follows:

"We can see no justification for action taken by the Phillips Petroleum Co. The cut in price in West Central Texas oil was because of inferior quality of oil, **according to statements by purchasing companies.** There is no such condition existing in the Panhandle field."

The point is important, perhaps, because the quote as reproduced in the Journal seems to indicate that the Panhandle group concurred in the purchaser excuse of inferior quality. Their full statement indicates clearly that they did not do so and deplored price cuts generally. They cited the West Central Texas excuse only to point up that there is no logic to the price cuts.

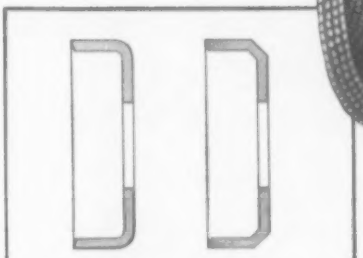
Of course, this has nothing to do with TIPRO, and the only reason I'm sticking my nose in it is that we are quite anxious to avoid any implication that independents in one area of Texas are at odds with independents in others on this important subject.

W. E. Turner
Executive vice president
Texas Independent
Producers and Royalty
Owners Association.

New England Independents Protest

"We shall again acquaint the Conference of New England Governors, the Conference of New England Senators, and our representatives in Congress with our concern in this matter (the request made to Mobilization Director Flem-

2-way gain with PUMCUPS



Cross-section of conventional and 45° bevel type Pumcups.

Darcova Pumcups are available in various types and textures, in a complete range of sizes, to provide unequalled efficiency and long life in reciprocating pumps, air or hydraulic mechanisms.

★ prolonged high efficiency
★ less maintenance

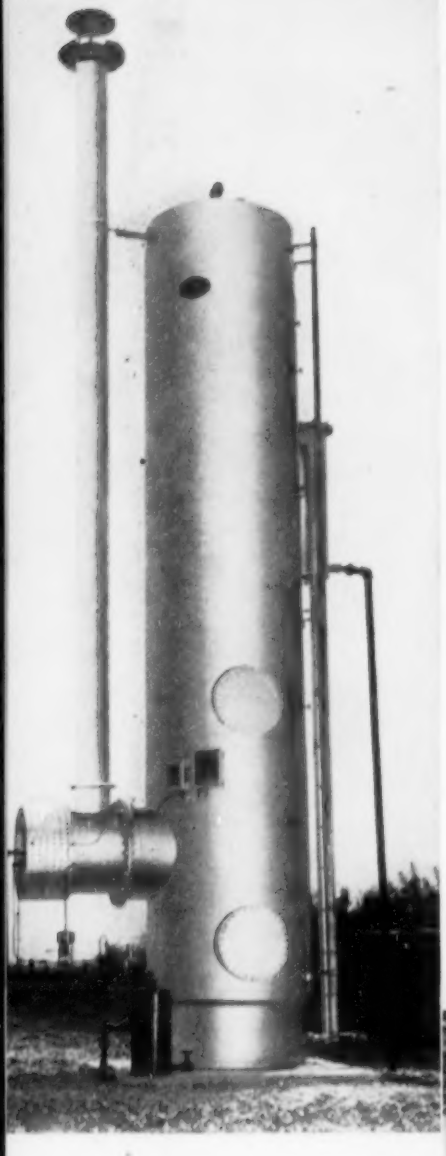
TODAY hundreds of companies using hydraulic controls, air cylinders or reciprocating pumps are *standardizing* on Darcova Pumcups for piston packing, because they eliminate fluid slippage, costly down-time and maintenance.

Darcova Pumcups make the *most* of the cup packing principle. And, they are made in a complete range of sizes, types and texture-engineered compositions for various pressure-temperature-fluid conditions. Pumcups hold peak efficiency for the life of the cups and outlast other packing as much as 3 to 1.

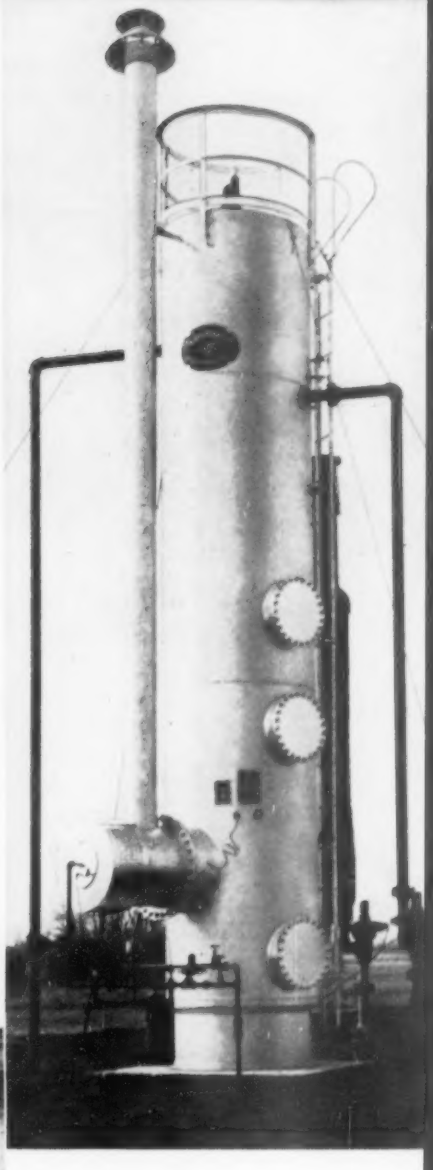
Why not check these claims right in your own plant? Meanwhile get *all* the facts. Just send for Pumcup Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS



There's a PARKERSBURG TREATER *for every requirement*



Parkersburg offers you 34 sizes in 5 series of Emulsion Treaters specifically designed to meet the emulsion characteristics of any producing well.

Whether you are treating loose or tight, foaming or non-foaming emulsions . . . handling large volumes of oil and/or gas . . . whether you require high heat capacity and long retention time—Parkersburg has the "one right" treater that will give you optimum treating performance under any of these conditions.

Moreover, from Parkersburg's extensive line of emulsion treaters, you get better emulsion and free water separation; more effective emulsion breakdown; more specific separation of emulsion into clean oil and water; greater maintenance of high gravity oil through conservation of lighter fractions.

When you need an emulsion treater it will pay you to talk to your Parkersburg representative about the "one right" treater for your particular producing requirements.

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ming by domestic producers asking that the Government reaffirm the 1954 price formula for curbing imports).

"We are astonished at the effrontery of 19 domestic producer associations in proposing that the part of the cabinet formula relating to residual oil be applied at once.

"This is none of their business. It is our opinion that the problems of residual and crude imports are separate, and we object to the efforts of the domestic producers to lump them together for political purposes. Imported residual is not causing a loss of market to domestic residual."

Donal M. Sullivan, executive secretary, Independent Oil Men's Association of New England.

Present Law Not Enough

"This act (California's oil and gas conservation proposition) . . . will not permit government control of the industry. No authority is given the state to interfere in the voluntary conservation agreements between producers.

"However, the experience of the California producing industry has demonstrated that voluntary compliance with conservation principles—while practiced by responsible elements of industry—has not been sufficient to protect the state's oil and gas resources from some wasteful exploitation. A conservation measure such as that proposed will tend to stimulate such voluntary agreements.

"This act is not a price-control device. It is a true conservation measure.

"This act does not encourage imports. California is now, and will be increasingly, short of oil. Any measure which safeguards the production of additional billions of barrels in the coming years will have the effect of minimizing, not increasing, imports into the state."

R. G. Follis, chairman of the board, Standard Oil Co. of California, in the Bulletin, July 1956.

Arrogance in Price Cuts?

". . . It is . . . unfortunate that domestic purchasers are cutting prices now. It seems apparent to us that the American oil industry might be called on in coming months to increase production appreciably, if the Middle East oil is cut off. We cannot do this if prices do not provide an incentive for the search.

"Even if there were no immediate considerations, such as the turmoil in the Middle East, prices should go up, rather than down. Rising steel and other production costs make this apparent.

"Unfortunately, there is some evidence that these price cuts result in part from the unwholesome desire of a

E. R. P. CATHODIC PROTECTION ...
INDIVIDUALLY DESIGNED FOR EACH APPLICATION

An effective installation that operates at the lowest cost per year requires experienced engineering evaluation of site and environmental conditions. The Electro Rust-Proofing Engineering Division makes available to you the cumulative experience gained in designing more than 10,000 cathodic protection systems.

Electro Rust-Proofing can furnish any one, or all, of the following services to help you provide proper cathodic protection for each of your jobs:

- Corrosion surveys and recommendations
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- Service to assure proper operating results

For additional information write today.

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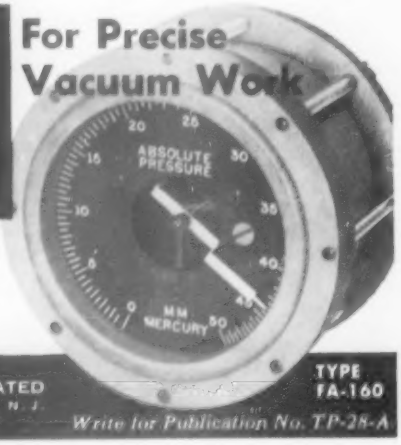
ABSOLUTE PRESSURE INDICATOR

For Precise Vacuum Work



Ranges: From 0—50 mm to 0—800 mm Hg. absolute in six ranges
Accuracy: 1/300 of full scale
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Dial Size: 2¾" or 6" diameter

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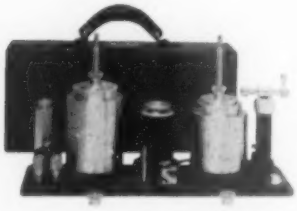
CENTRAL SCIENTIFIC COMPANY

R.S. PORTABLE DEAD WEIGHT TESTER

for accurate testing of high pressure up to 5,000 psi



The only truly portable dead weight tester of this capacity

An extremely compact instrument for pressure gage testing and calibration to pressures of 5,000 psi. Standard Accessories include an adaptor so the tester may also be used as a dead weight gage. Can be furnished in ranges of 5-1000 psi or 50-5000 psi.

FOR FAST FISHING TOOL RELEASE
—When You Want It—Use the

BOWEN BUMPER SUB

Releasing type fishing tools such as spears, sockets and overshots require downward blows for release of slips or grapples . . . and the handiest tool you can use to obtain downward blows when fishing with equipment of this type is the BOWEN Bumper Sub.

It is amply strong to stand the abuse of drilling and fishing under all conditions, and requires only occasional servicing.

Write for full details!

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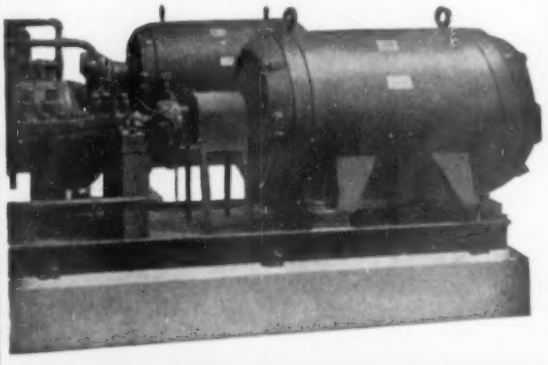
EXPORT REPRESENTATIVE: TULA & WOOTEN, INC.

EXPLOSION PROOF MOTORS



Continental ELECTRIC MOTORS

PLANTS:
17 Main St., Newark 5, N. J.
1240 Harrison Ave., Rockford, Ill.

few large companies to dictate Texas allowables in relation to their imports. Because allowables were set here at higher rates than they found desirable, some companies seem disposed to penalize Texas producers with price cuts.

"Such an attitude, to the extent that it exists, is little short of arrogance, and it must be exposed and dealt with ruthlessly."

A. E. Herrmann, president of the Texas Independent Producers and Royalty Owners Association, in a TIPRO statement of policy.

Economic Morals and the Suez

"The thing that is basically wrong with the Suez seizure is not that it is an expression of Egyptian nationalism, nor even that it is a defiant gesture against the West as a whole. What is wrong is that this is a unilateral action—more than that, a one-man action—that strikes at the whole fabric of multilateral agreement.

"If, at any time and under any conditions, a man or a nation can simply throw away their commitments the whole basis for normal living is undermined, if not destroyed.

". . . Such actions as Nasser's . . . make a real international credit structure almost impossible. Credit has to rest on the understanding that obligations will be met and that commitments will be honored. When that condition no longer obtains, credit becomes a political gamble that is not worth taking.

". . . An American secretary of state said almost a hundred years ago that in an orderly world there could be no unilateral abrogation of a multilateral obligation. Our relations with other states are based on that necessity for making good on our commitments. This is not merely the 'sanctity of treaties.' It is a way of doing international business.

". . . It is a question of whether international agreements such as that respecting Suez are morally binding or are scraps of paper to be torn up at the whim of a dictator. That is a matter of the utmost concern . . . for all of us."

Editorial in the New York Times.

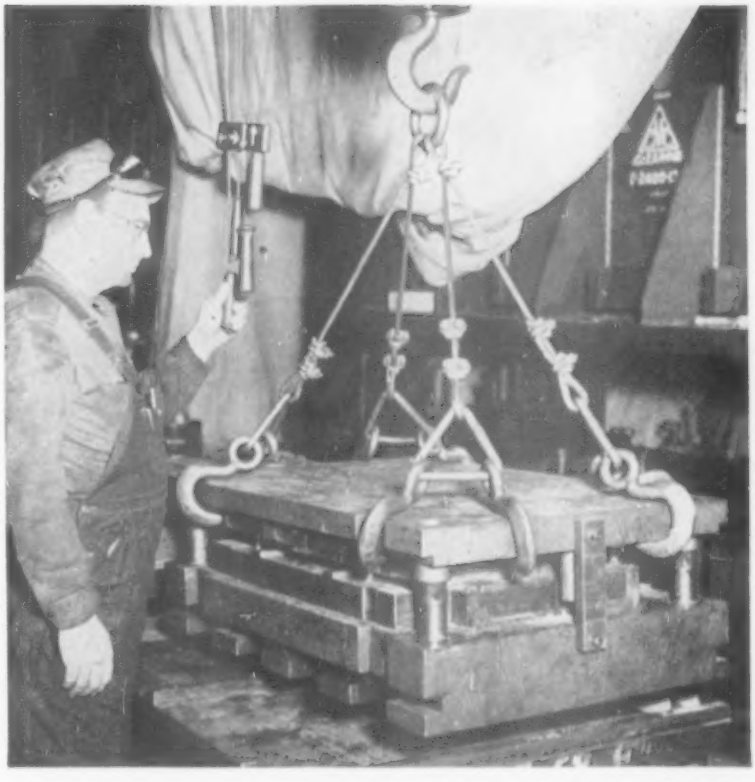
CALENDAR

SEPTEMBER

4-11 International Geological Congress, Mexico City.

5-7 Wyoming Geological Association eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

7-8 Association of Desk and Derrick Clubs of North America, annual convention, Roosevelt Hotel, New Orleans.



RIGGED FOR SAFE DIE HANDLING

To handle heavy, expensive die sets with complete safety, this manufacturer uses eight Laughlin Eye Hoist Hooks—two on each corner. The wire rope is positively secured with genuine Crosby® Clips and Laughlin Thimbles protect the rope at the lifting points.

LAUGHLIN HOOKS—drop forged and heat treated—take the risk out of this job. They're precision designed and manufactured from special high quality steel—construction that results in maximum strength and uniformity without excessive weight. Hooks are available to fit rope up to 1½" with capacities up to 20 tons!

TOUGH LAUGHLIN THIMBLES, manufactured from hot rolled steel bars, resist crushing forces. They're offered in sizes to fit all ropes from ⅛" to 2¼"!

GENUINE CROSBY CLIPS provide maximum holding power for wire rope from ⅛" to 3" in diameter. In every application where the safety of men or materials must depend upon wire rope rigging, safety engineers specify Crosby Clips! Look for the "Red U-Bolt"®—you'll see it in use everywhere—in every industry!

THE STRONGEST LINK

Wherever a chain link is replaced or connections made, a potential safety hazard exists—unless genuine Laughlin "Missing Links"® are used to do the job! This easily installed split link is essential whenever maximum safety is required. It's as strong as BBB chain! Drop forged "Missing Links" are matched to a perfect fit under tons of pressure. Your Crosby-Laughlin Distributor carries a complete range of sizes from ⅜" to 1⅝"! Insist on the *genuine* "Missing Link".

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CROSBY-LAUGHLIN *Division*

American Hoist and Derrick Company

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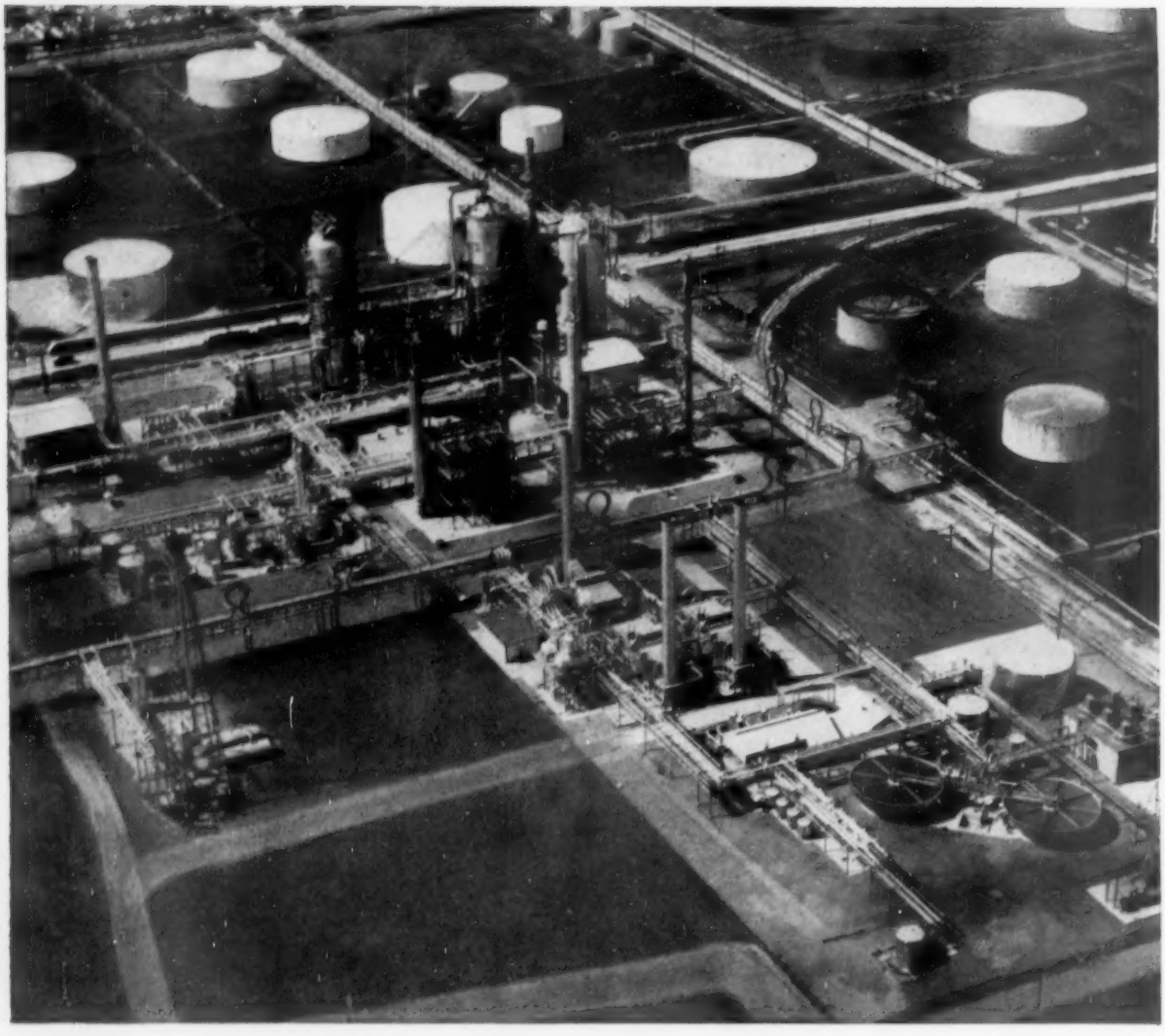

Pritchard's Right for Off-Site!

When choosing the right company to design, engineer and construct your off-site facilities, you will look for these qualifications:

Experience . . . the kind of off-site experience that comes from working on large, complex jobs involving many diverse processes, necessitating many diverse skills.

Attitude . . . Pritchard's trained personnel have the right attitude toward your job. They work closely with your staff. This close harmony means greater efficiency, greater savings in time . . . your assurance that the job will be done right, and right on time.

Contract . . . like Pritchard's increasingly popular Single Responsibility Contract that frees you from detailed arrangements, saves you time, effort and money.

Pritchard is the company you are looking for. Measure Pritchard's experience, knowledge . . . their way of doing business . . . against your most exacting criteria, and you'll agree that Pritchard *is* right for your next off-site job.

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Pritchard is right for off-site!

Pritchard is well qualified to build many types of refinery off-site facilities. Like product storage and handling, drying and treating. Steam, electric and gas fuel utilities. Water and waste disposal systems.

This is over and above Pritchard's unique ability to serve you in many other specialized facets of oil field and refinery processing.

If you are planning to expand or modernize your refinery operation — any phase, including off-site facilities — you are looking for experience, know-how and proved performance. You are looking for Pritchard! Why not discuss your construction plans with a Pritchard representative?

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9-11 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

9-12 American Institute of Chemical Engineers, William Penn Hotel, Pittsburgh.

11-13 Pacific Coast Gas Association, annual meeting, Hotel del Coronado, Coronado, Calif.

12-14 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

16-18 Pennsylvania Petroleum Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

16-21 American Society for Testing Materials, second Pacific area national meeting, Statler Hotel, Los Angeles.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York.

19-21 Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C.

20-21 National Association of Corrosion Engineers, sixth annual short course, Centenary College, Shreveport, La.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

20-22 Oklahoma City Geological Society, field conference, Guymon, Okla.

21 Southern Gas Association, conference of gas measurement superintendents, Tutwiler Hotel, Birmingham, Ala.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

1-5 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

8-10 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

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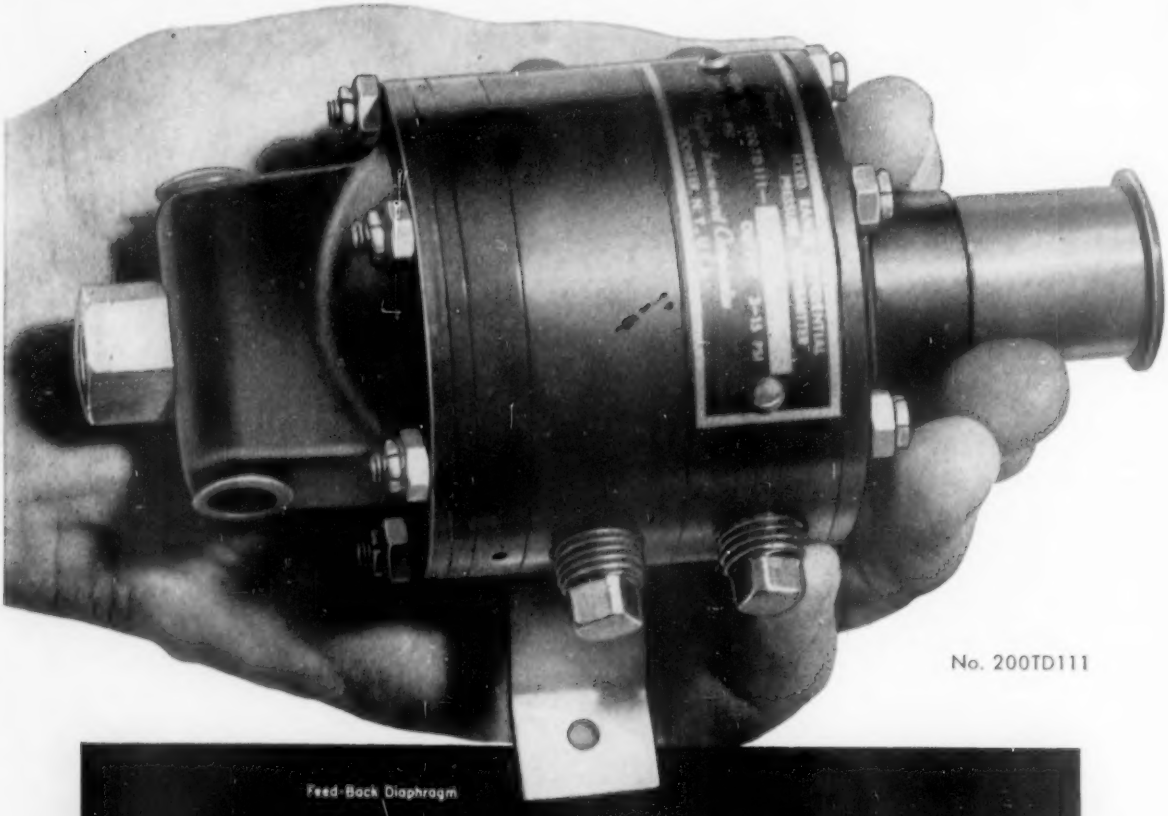

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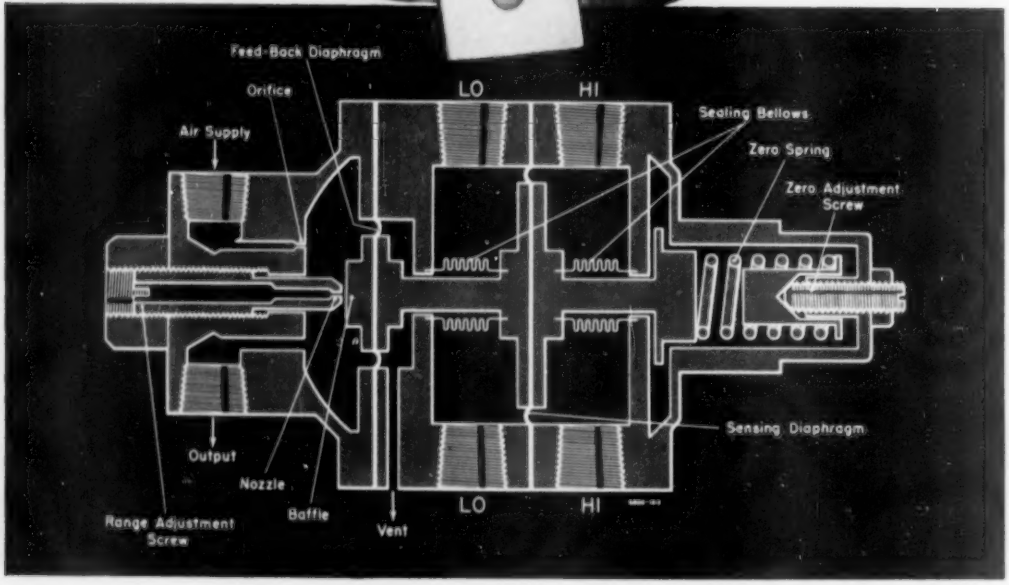

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15-17 American Gas Association, annual meeting, Atlantic City, N. J.
18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.
18-21 Permian Basin Oil Show, Odessa, Tex.
22-24 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.
22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.
23-26 National Association of Corrosion Engineers, south central region, San Antonio.
26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.
26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.
25-26 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, nineteenth annual meeting, Sheraton Park Hotel, Washington.
29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.
29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.
29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.
31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.
7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.
8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.
8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.
12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.
25-30 American Society of Mechanical Engineers, Statler Hotel, New York.
30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.
29-Dec. 1 Interstate Oil Compact Commission, annual meeting, Allis Hotel, Wichita.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.
9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

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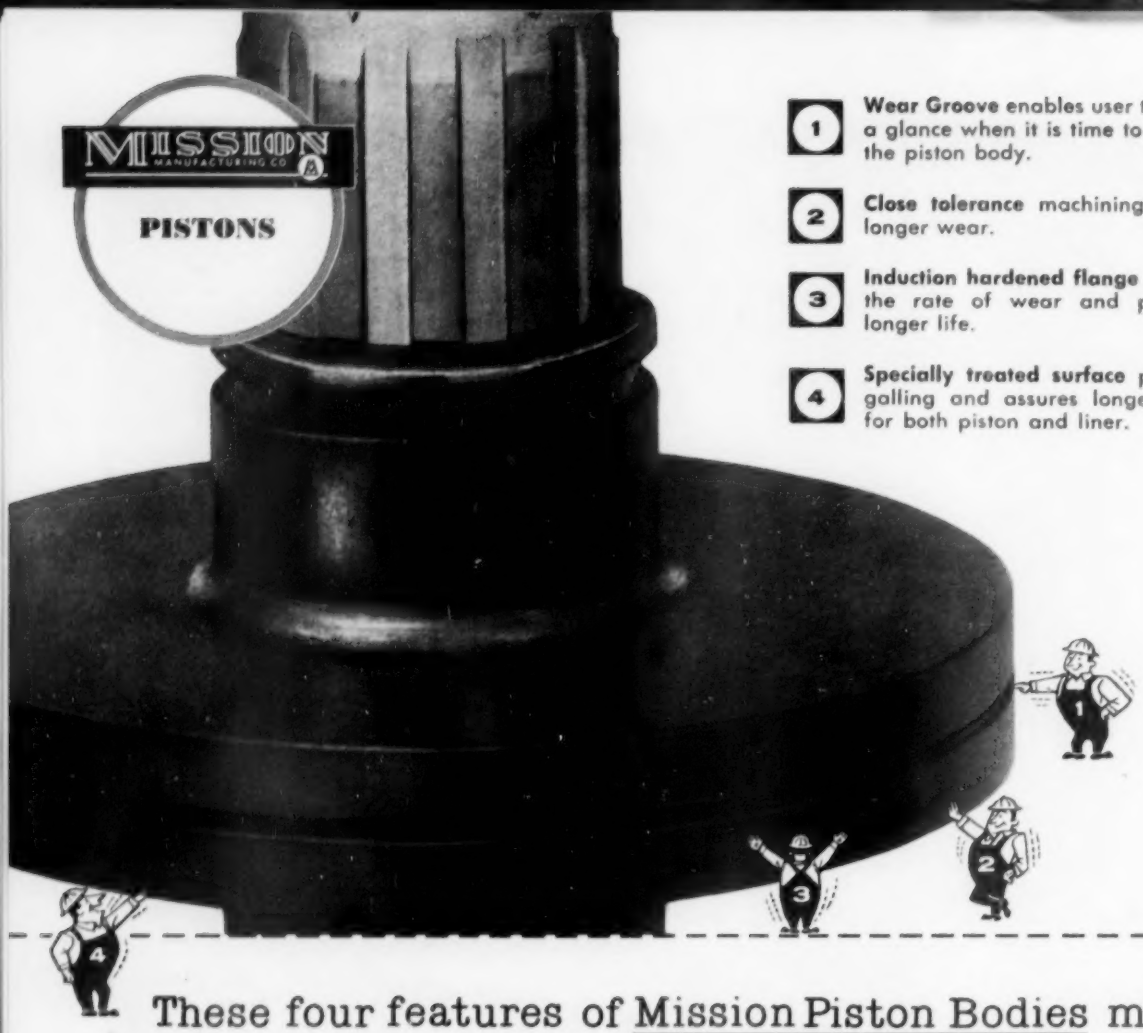

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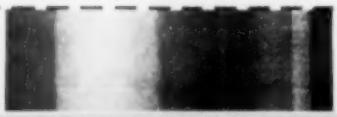

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JOURNALLY SPEAKING . . .

Blue-Plate Geology

IT'S not often that we print a contribution in this department. And for a very good reason: We don't get many.

However, we must live right, for just as we were getting ready to go on a vacation, and with what we laughingly call our mind full of schedules and travel folders instead of deep thoughts for this column, a contribution came in over the transom. Just like money from home.

For a fraction of a second we hesitated about using it because it's about geologists, and we have received some anonymous threatening letters as a result of some of our previous writings about the rock-hound profession in a not completely serious and complimentary vein.

But our doubts were resolved when we discovered that this piece was written by a geologist. And he must be a serious geologist, for he not only lives geology, but eats it, too.

Here's his essay, verbatim:

Mark Gerric had been studying structure maps since 7 o'clock that morning and he would probably still be at it at 7 o'clock that evening.

Now, in Gay's Diner, seated next to Hank Marvins, he wanted to eat some lunch and forget structure for a half hour.

His mind and his eyes were fixed blankly on his shoes when the waitress brought him his order of roast beef, greeen peas, mashed potatoes and gravy, and tossed salad. His mind was still blank when he picked up his knife and fork and poised them, ready to cut off a corner of the roast.

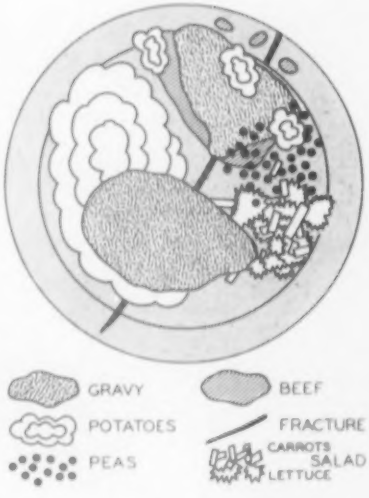
"I couldn't figure what you were doing," Marvins told him later. "For a good 30 seconds you sat there holding your knife and fork, just staring at your plate! What the Sam Hill were you thinking about?"

"Well," said Gerric, "it took me that long to figure out the structure of my lunch."

"To figure out the stru . . . ." you balmy?" Marvins asked.

"Maybe so." Gerrick scratched his chin. "But it was rather interesting."

"You see the floor of the basin was



exposed pre-Cambrian china and the tension fracture across it obviously was there before anything was deposited.

"An overthrust fault brought the roast beef into the area next, leaving particles of beef debris leading across the edge of the basin.

"The gravy on the beef was extruded next, since it underlay everything but the beef. Part of the extruded gravy was then covered with a poorly consolidated conglomerate of green peas. The gravy extrusive had not yet solidified so the green pea conglomerate mingled with it to a small degree.

"The deposition of the mashed potatoes was the most violent action of all, with large potato splashes on the far side of the green pea conglomerate and the beef Klippe.

"Next came the tossed salad conglomerate which, with one exception, overlay everything else. Though the salad conglomerate was well concentrated directly over a small area of pre-Cambrian china, some of the lettuce and carrots lay exposed on the previously deposited elements.

"The cook had almost forgotten to put gravy on the potatoes, and since the potatoes were closely associated with the tossed salad conglomerate, the salad received a good share of the final eruption of the viscous gravy."

—*Henry D. Ralph.*

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Suez hassle could spread to our own doorstep

CURRENT comments reveal that the significance of Egypt's action in nationalizing the Suez Canal is not generally understood.

Many assume that the problems that may develop are of importance only to the users of petroleum in that area and that local remedies will be found should a complete or partial curtailment of Middle East oil supplies result.

Such a conclusion is unrealistic and is dangerous to the present and future of free peoples everywhere—none more than to those of this country.

The truth is that the rehabilitation of the war-devastated and other countries and the establishment of defenses of friendly people against a common enemy over 10 years have been largely based on the availability of Middle East oil. And the job has not been completed.

A FEW KEY FIGURES will serve to illustrate this situation. Middle East crude oil production has increased fivefold since the close of World War II. The current output of 3,700,000 bbl. daily is 24 per cent of the free world's supply.

Of even greater significance, as regards the future, Middle East fields now have 70 per cent of the free world's proven reserves. And these reserves are certain to increase for an indefinite period.

About 60 per cent of this oil is now shipped to Europe and the Western Hemisphere via the Suez Canal and the pipelines to the Eastern Mediterranean.

It is this oil that has effected the reconstruction of Western Europe, financed by billions from this country. As one result, farm and plant output of several of these countries now exceeds that of any previous period.

European refinery capacity, as modern in facilities as those in this country, has more than tripled since World War II, with the Middle East the principal source of crude oil. These refineries have not only furnished the greatly needed products for Western Europe's rehabilitation and growth, but have also supplied most of the requirements for the all-important military operations in that crucial part of the world.

THAT IS NOT ALL. Middle East petroleum has made possible major refinery construction in Australia, India, the Philippines, and other eastern points.

It is true that comparatively little of this eastern petroleum comes to this country or the rest of the Western Hemisphere.

But it should be apparent that any reduction in Middle East oil or transportation must be made up from this hemisphere. Otherwise we will have no effective international program and we stand to lose quickly what we have gained over the past decade.

Our main thought here is that the Middle East has become a dominant factor in an oil world. Any interference with the orderly production and movement of this oil is certain to react quickly and in a big way back to our own doorstep.

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Current and significant in . . .

The Industry This Week

Processing

• **Petrochemical boom** shows no signs of losing any steam. Its 400 new uses a year mean a doubled capacity in 5 years. One thing to keep in mind: Petrochemicals take only a trickle of oil but return four times more profits than conventional refining. P. 64.

Pacific Petroleums is moving further into Canada's Peace River oil picture with purchase of major interest of X-L Refineries at Dawson Creek. P. 76.

Exploration

• **Iran's most fabulous well** is the tag being put on National Iranian Oil Co.'s discovery which blew out last week. The north-central Iranian wildcat, 200 miles from nearest production, is throwing at least 80,000 bbl. of oil daily 150 ft. into the air. It may open tremendous oil possibilities for the interior of Iran. P. 84.

Cuban farmout deals are picking up. Biggest is Stanolind's agreement to drill on 1,118,000 acres of White Eagle International's holdings. P. 85.

A major California discovery offshore from Coal Oil Point in Santa Barbara County may have been made by Richfield testing a 3,840-acre lease. P. 78.

Former deepest well in Texas, abandoned 2 years ago because of a hopeless fishing job, now may be carried deeper by Gulf. P. 70.

Industry

• **A 30-hour work week** with no cut in take-home pay will be among the goals of O.C.A.W. when the union starts negotiating in 1957. P. 67.

Strong demand for tankers with skyrocketing prices for the vessels is one result of Suez crisis. The development is nearly halting U. S. trade-in-and-build program. P. 75.

Egypt, meanwhile, is recruiting pilots as manpower shortage begins to slow up traffic on Suez Canal. P. 86.

Production

• **A sharp cutback in fourth-quarter imports** is being asked by Mobilization Director Flemming in latest letter to oil importers. P. 74.

Humble's new condensing-gas drive for secondary recovery will get a trial in Texas' Bronte and Seeligson fields. Prospects are 50 per cent more recovery than by flooding. P. 80.

Free-world production has set another record—14,945,800 bbl. daily for June, up 93,700 bbl. daily from May. U. S. output rose to 7,100,000 bbl. daily for a 36,000-bbl. gain. P. 83.

Pipelines

• **El Paso Natural's move toward integration** has become a rush. This pipeline giant in less than a year has bought three refineries, made plans for two more, and is going into petrochemicals and marketing. P. 72.

First automation systems in Texas for transferring oil production from lease to pipeline have been approved for trial period. Pioneering the work are Phillips in Panhandle field and Shell in Clay County. P. 68.

Conversion of Little Big Inch from gas to products comes up again in FPC hearings this month. It's now coupled with Texas Eastern's request to import Mexican gas. P. 71.

Petrochemicals: No Bust in the Boom

● 400 new uses a year mean a doubling of capacity in 5 years. It's still just a trickle compared with oil refining, but the payoff is four times richer

John C. Reidel
Petrochemicals Editor

PETROCHEMICALS are living up to their role as the glamor girls of oil and gas processing. And by all standards they'll be just as attractive in the next 5 years.

The boom aura which surrounds the industry is borne out by statistics. These are the prospects:

. . . **Production** may reach 60 billion pounds by 1960, according to more optimistic estimates. It totaled 31 billion pounds last year and is expected to exceed 34 billion pounds this year.

. . . **Investment** in petrochemical plants should exceed $8 billion by 1960, about double the $4 billion invested at the start of 1956. Butadiene currently is leading this expansion parade with present projects adding 29.4 per cent to plant capacities.

. . . **Sales** are running at about the same ratio. They totaled $3.7 billion last year and are up about 20 per cent this year.

It takes little imagination to grasp the sweep of petrochemical gains. Total production now represents about 24 per cent of U. S. chemical output. It should rise to 33 per cent in 5 years. In value, petrochemicals already represent more than 50 per cent of all chemicals.

The U. S. Tariff Commission reports the volume of organic petrochemicals alone reached the all-time high of 16,178,962,000 lb. in 1955, up 20.3 per cent from 1954 and 88 per cent since 1951 *(The Oil and Gas Journal, July 2, page 72)*. This does not include synthetic anhydrous ammonia, hydrogen sulfide, or the host of other basics which wind up in the markets as inorganic chemicals.

Where they go . . . This flood of oil and gas-derived chemicals finds its way into nearly 3,000 chemical substances. And one process company official estimates new products using petrochemicals are being added at the rate of 400 per year.

John A. Field, vice president of Carbide & Carbon Chemicals Co., pin points four major fields where petrochemicals will flourish:

. . . **Plastics** is probably the fastest grower. Field estimates about 20 per cent of all petrochemicals will go into plastics within a few years, paced by the rapid gains of polyethylene.

Another source estimates plastics sales have jumped 140 per cent since 1948 and should reach $2 billion this year on a production volume of 4 billion pounds.

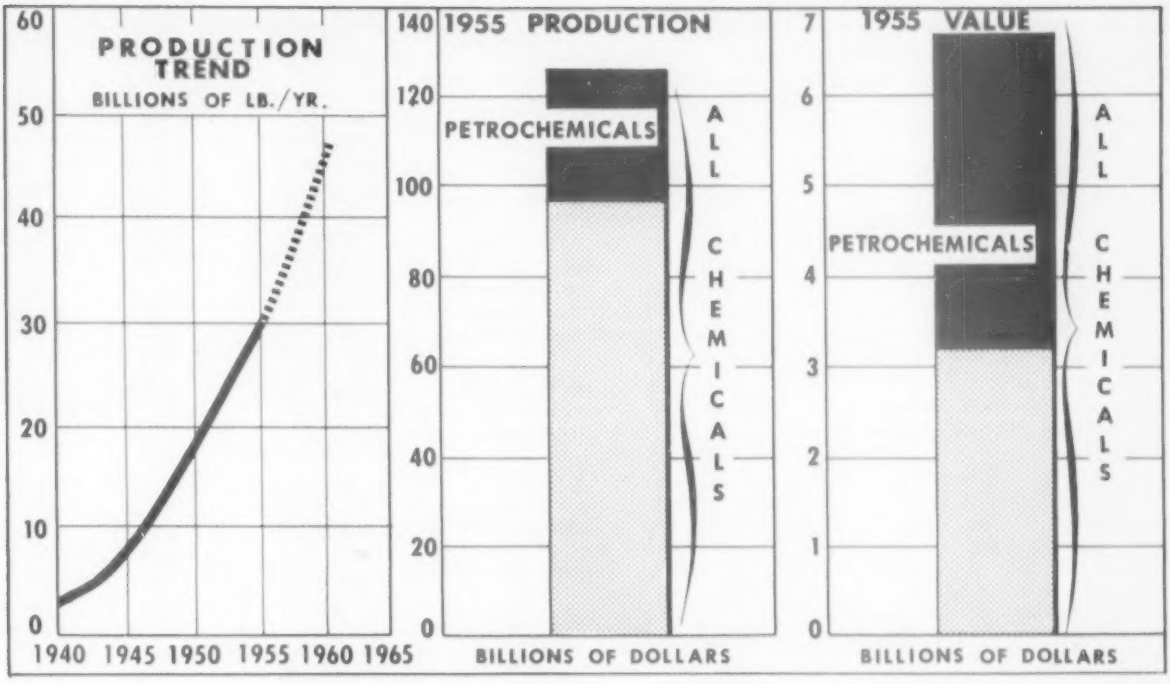
. . . **Synthetic rubber,** almost 100 per cent petrochemical, will require a big chunk of production. Presently more than 1 billion pounds of butadiene and over 300 million pounds of styrene are used annually in synthetic rubber. By 1960, these needs will total 1.5 billion pounds of butadiene and 450 million pounds of styrene.

. . . **Synthetic fibers** are expected to keep up past gains which saw their production grow six-fold in 10 years. Du Pont officials estimate by 1960 1.8 billion pounds of synthetic fibers will be sold. This includes 950 million pounds of cellulosics which are partly petrochemical and 850 million pounds of all-petrochemical synthetics.

. . . **Detergents** are growing faster than ever and by 1960 should consume more than 1 billion pounds of petrochemicals.

Other uses, such as fertilizers, oil additives, surface coatings, and drugs swell the total future requirements for petrochemical raw materials.

Who's in business . . . The rush into



petrochemicals has attracted nearly 200 companies in the United States and Canada.

At the start of 1956, the field included 63 oil companies, 72 chemical companies, 45 petrochemical firms and several joint enterprises. For an idea of the scope of the industry, the companies making petrochemicals and what they're building, see The Oil and Gas Journal's annual plant survey on page 89.

Capital expenditures given in the survey underscore one point: It takes a heavy investment to get in and stay in petrochemicals. Plant changes are required constantly to keep up.

Why then the attraction, especially to oil refiners who have problems keeping pace with octanes? O. V. Tracy, president of Enjay Co., Inc., explains it simply:

"Conventional petroleum refining upgrades crude oil one and one-half times . . . A similar barrel of crude when turned into chemicals, results in products whose combined value is six and one-half times the value of the crude."

The greater profit margin and the fact he is dealing with his own by-products have put the oil refiner squarely into the business of supplying petrochemical raw materials.

The attractiveness of the industry has produced peculiar petrochemical growth cycles. Plant-investment dollars will rush into a new phase of the industry, such as ammonia in the past and polyethylene now. Production capacity jumps ahead of demand. Plant building slows down while the marketing specialists find new uses and customers for plant products.

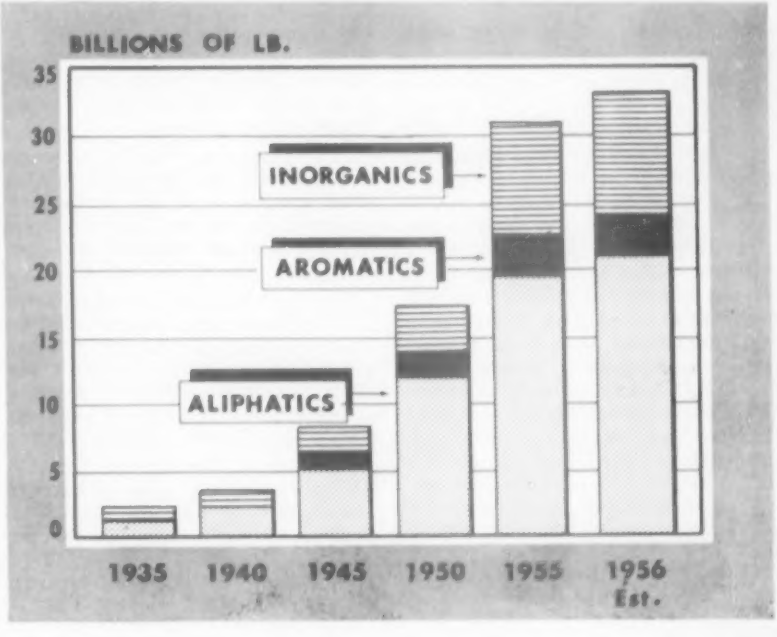
Such plant-building peaks were experienced in 1947, again in 1953 and 1956. Between were valleys during which demand caught up.

"The strength of the industry in closing up the gaps between supply and demand and the vigor with which markets grew up to enlarged supply is heartening evidence of soundness and vitality," Tracy says.

New trends . . . The natural-gas and L.P.G. industries are increasing their position as the No. 1 raw-material suppliers for petrochemicals. Oil refiners may have to trim their sails.

Relative positions of these segments of the petroleum industry are dictated by one fact: Petrochemicals still play second fiddle to the gasoline business.

For instance, in 1955 petrochemicals consumed 15.5 billion pounds of hydrocarbons from petroleum and natural gas. This is equivalent to about 50



million barrels of crude oil—actually only 1.8 per cent of crude runs to stills. Thus, although petrochemicals are important to the oil industry because of profits involved, they do not provide an enormous outlet for crude or natural gas.

The oil refiner's main business is still fuel, and he now is involved in a battle to keep up high-octane gasoline production. This is forcing the refiner to consider using many light hydrocarbons which formerly were diverted to petrochemicals. These include isobutanes, toluene, xylenes, propylene, and butylenes *(The Oil and Gas Journal, April 16, page 134).*

This development is causing the petrochemical manufacturer to turn increasingly to natural gas and natural-gas liquids for raw-material sources. The trend explains location of a few big petrochemical plants adjacent to big natural-gas transmission systems. It also explains why chemical and synthetic-rubber production took nearly 30 per cent of L.P.G. marketed in 1955.

This trend is expected to grow. At least three pipelines are being converted into products service to bring light ends from West and Southwest Texas to "petrochemical row" on the Gulf Coast.

Phillips Petroleum Co. is switching a 465-mile line to carry natural-gas liquids from West Texas to Sweeny for making motor gasoline and 290 million pounds of ethylene annually. Magnolia Petroleum Co. is converting a 540-mile crude line from Midland to Beaumont to light ends. Tennessee Gas Transmission Corp. is building a light-ends line from Southwest Texas to Barbers Cut near LaPorte.

The big boys . . . The major petrochemical building blocks continue to be ethylene, propane, propylene, butadiene, toluene, and butylene. The big expansion centers around two of these:

. . . Ethylene. The record production of 3.05 billion pounds of ethylene in 1955 was caused by the chemical's increased popularity. The demand was created by needs for polyethylene, tetraethyl lead, ethanol, ethylene oxide, styrene, and ethyl chloride. There's no tapering off in sight for the chemical.

. . . Butadiene. The ever-increasing demand for synthetic rubber is the spark behind the continuing expansion in butadiene facilities. Present construction under way will boost butadiene capacity from 643,000 short tons per year to 832,000. With world demand for rubber expected to grow at the rate of 4 per cent per year, there's apparently no lid on the butadiene expansion pattern.

A rival for ethylene may be moving on the scene in acetylene. Like ethylene, acetylene is highly reactive and lends itself to a variety of possible uses. Acetylene is proving itself popular as the raw material for the synthetic fiber and plastics industry, for neoprene, vinyl chloride, and emulsion paints. It is expected to enjoy an 80 per cent growth in the next 5 years.

This optimism is boosted by acetylene's position as the starting point for an entire acrylonitrile industry. Production of acrylonitrile alone in 1955 was 117.7 million pounds, an increase of 87 per cent in a year. Much of the output is going into acrylic fibers and nitrile rubber.

The acetylene field is attracting the petrochemists. Several large plants now manufacture acetylene by partial oxidation of natural gas. American Cyanamid, Carbide & Carbon, and Monsanto Chemical produce it in this manner. American Cyanamid is doubling capacity of its Fortier plant near New Orleans. Other big firms are reported surveying the field.

This potential rivalry between ethylene and acetylene shows the intense competition in the petrochemical industry between raw materials, processes, and products. It points up the one rule for survival in petrochemicals: You can't stand still and live on last year's reputation. A new product and new market may lie just ahead.

Salvage Job Starts

Big crane to help upright overturned drilling barge

NEW ORLEANS.—An 800-ton crane, the largest operating in the gulf area, will be used in attempting to upright the $1,500,000 drilling barge which capsized in the Mississippi River near here 3 weeks ago.

Avondale Marine Ways, Inc., builder of the barge, will attempt to salvage the vessel early this week. The 800-ton crane operated by J. Ray McDermott, Inc., will lift on the 2,500-ton barge from the river side with assistance from onshore equipment.

The shipbuilder received a check for $1,339,782 last week as settlement on an insurance policy covering the barge and drilling equipment. The check was issued by Marine Office of America, an organization representing several insurance companies.

The barge was nearing completion at the Avondale yard when it capsized without warning on August 10. The vessel was being built for Southeastern Drilling Co. and was scheduled to go to work for The California Co. in the Bay Marchand area off Louisiana.

Processing BRIEFS

LOS ANGELES. — Fluor Corp., Ltd., has been awarded a $5,000,000 construction and engineering contract to build a 27,000-bbl. daily fluid cat cracker at the 38,000-bbl. El Paso, Tex., refinery of Standard Oil Co. of Texas. Work on the project will begin in December. Completion is set for September 1957.

The contract calls for a model IV fluid catalytic cracking unit including installation of fractionation, gas recovery, caustic treating compression, and distillation facilities. It will be the fifth model IV cat cracker built by Fluor in the past 3 years.

The Census Bureau of the Department of Commerce has corrected its reported total of gasoline imports for June. The original report showed June gasoline imports at 2,466,518 bbl. *(The Oil and Gas Journal, August 20, page 108).* This total was questioned by The Journal, and the Census Bureau has issued a revision.

Gasoline imports into the New York customs district from Trinidad was revised from 1,547,991 bbl. to 154,800 bbl. The total for all gasoline was corrected to 1,073,327 bbl.

RED DEER, Alta.—A 1,500-acre industrial tract has been purchased near here, presumably for a new petrochemical plant. Best bet is that it is for Polymer Corp., the crown-owned synthetic-rubber company based in Sarnia.

Polymer is outgrowing the local supply of butadiene from nearby Sarnia refineries and is importing about 25 per cent of its requirements from the U. S. The company has been considering western Canada for a butadiene plant.

Also for Refiners . . .

Petrochemicals boom will last another 5 years (P. 64) . . . O.C.A.W. plans drive next year for 30-hour week (P. 67) . . . Census Bureau says refining industry is now a billion-dollar-a-month business (P. 70) . . . Pacific Petroleums buys into X-L Refineries, plans integrated operation with big natural-gasoline plant . . . Humble employes at Baytown may take strike vote (P. 76).

Plus these features:

The Journal's Annual Petrochemical Survey telling who's processing what and where (P. 89) . . . A three-part article detailing expansion by National Petro-Chemicals Corp., with spotlight on diversification, revisions to up ethylene capacity, and why an ammonia plant was built (P. 105).

Short Week Endorsed

O.C.A.W. will negotiate for 30-hour week with 40-hour pay next year; group also moves to increase its income

DENVER. — A 30-hour work week with no cut in take-home pay will be demanded by the Oil, Chemical and Atomic Workers International Union during negotiations for 1957 work contracts in the oil industry.

A resolution supporting the 30-hour week with current 40-hour take-home pay was adopted by the union at its recent convention in St. Louis.

The proposal, as originally submitted by O.C.A.W. Gulf Coast - Louisiana District 4 Council, called for a 36-hour work week. The union's resolutions committee changed it to 30 hours before submitting it to the convention for a vote.

The resolution stated O.C.A.W. "feels there is definite need for adopting a program of shorter hours so that none of our members be laid off who are working under the jurisdiction of the international . . . such a program of shorter hours with a decent living wage would solve problems arising from any present and future layoffs."

The convention also approved a resolution requesting the union's bargaining policy committee to consider a drive for premium pay for Saturday and Sunday work when it drafts the 1957 program of wages and fringe benefits to be presented to the industry this fall.

The 54-member committee, which annually decides the union's contract demands, took no action on future wage policy, saying it is "prepared to meet again at the call of the chairman to launch such a program as may appear appropriate."

Bargaining tactics hit . . . The committee expressed "strong disapproval of a current employer tactic of always accompanying wage increase offers with a deadline for acceptance."

Terming this a hypocritical attitude "in view of the often-voiced demand by employers that there should always be a cooling-off period before strike deadlines," the committee said the union henceforth would "seriously consider means of combating this practice on the part of employers."

Union officials said prospects for large wage increases and substantial improvements in fringe benefits are "extremely bright," provided the organization can get enough money to step up its operations. To do this, the group:

. . . **Raised dues** paid by members to locals. The minimum is now $3 and the maximum $6. The old range was from $2 to $5.

. . . **Raised dues** paid by locals to the international. The monthly tab was upped from $1.35 to $1.50 per member.

. . . **Cut in half** the number of vice presidents. The union now has two rather than four vice presidents.

Officials served notice that it will launch a drive to land more members among oil and chemical workers. But this too hinges on more funds than it now has.

"An increase in the income of the union," members were told, "will be necessary if the union is to maintain even its present level of operations."

O. A. (Jack) Knight was reelected president and Elwood D. Swisher and B. J. Schafer were reelected vice presidents. Joe Appelbaum and John T. (Jack) Curran were the displaced vice presidents.

MOBILE UNIT for cleaning flow lines burns oil right from the well. It's a . . .

New Heater for Melting Paraffin

DENVER CITY, Tex. — A portable crude-oil heater has been developed here for cleaning paraffin from oil-well flow lines and for treating oil in storage.

Designed and constructed by W. L. Kidd Oil-Field Service, the unit is equipped with an oil heater which in most cases can burn crude oil right from a well or storage tank.

Field use of the portable rig shows that paraffin-plugged lines often can be cleaned out in 30 minutes to an hour, according to the operators.

In cleaning paraffin from a well, 10 to 20 bbl. of cold oil is first pumped into the casing at pressures of 1,250 to 4,000 psi. Then 30 to 40 bbl. of 400° oil is pumped from the heater into the tubing to melt the paraffin.

The heating unit, known as the Tex-heater 25M, was developed by Tex-steam Corp. of Houston. It can heat 70 bbl. of oil per hour to 275°. Smaller quantities can be heated up to 450°.

A 60-bbl. tank mounted behind the heater serves as a reservoir so oil may be circulated through the heating unit to raise the temperature as needed.

The rig is mounted on a 6-ton truck. The unit is equipped with a high-pressure triplex pump which will force hot oil into a well at pressures up to 5,000 psi. On most jobs one man can operate the entire unit from controls about 3 ft. behind the cab of the truck.

Hot water may be substituted for hot oil in treating wells which produce salt water.

The developer claims the oil heater has an advantage over portable steam units in that oil can be heated to higher temperatures without excessive pressures.

Robot Gagers on Trial

Texas Railroad Commission allows Phillips and Shell to pioneer the use of automatic custody transfer systems

AUSTIN.—Texas' first automatic systems for transferring oil production from lease to pipeline were given a conditional green light by the Texas Railroad Commission last week.

Phillips Petroleum Co. was granted a permit to install and operate an automatic custody system to tender oil from its Ranch "C" lease in Panhandle field of Hutchinson County.

Shell will install a similar system on its Hugh Henderson lease in Antelope field of Clay County in North Texas.

The two companies sought permits for the facilities simultaneously in July *(The Oil and Gas Journal, July 30, page 122)*, and their applications were bolstered by supporting testimony from other large producing and pipelining firms.

Trial period . . . The commission, however, tacked several conditions onto its approval.

Phillips and Shell will operate the systems for a trial period of 6 months. The commission will review results of the operations and the feasibility of continued operation at the end of the trial period.

Furthermore, the commission noted that royalty owners in the concerned leases apparently had not been contacted for their approval. It said this should be done and suggested that operators forward a joinder or formal waiver from the royalty owners in the near future.

In urging approval of the automatic custody setups, Shell told the commission it had found that weathering loss of hydrocarbons under conventional transfer methods comes to about 0.2 per cent of production. On Shell's Henderson lease this loss amounts to about 32 bbl. a month which the automatic equipment would conserve.

If such automatic systems could be applied to 60 per cent of Texas oil production, Shell figures oil savings would come to about 26,900,000 bbl. a year.

Other advantages . . . Along with the oil saved by eliminating weathering, Shell and Phillips said, the automatic facilities have other advantages. They will:

. . . Cut sharply the number of tanks needed on the lease, thus saving steel.

. . . Permit leveling out flow schedules to the pipeline. This would mean the flow of casing-head gas produced with the oil also could be evened out and gas waste by venting and flaring reduced.

. . . Give more accurate measurements of volumes, gravity, temperature, and b.s. and w. content of the oil. Also the systems would be harder to "jimmy" in order to run illegal oil than under conventional methods.

Used elsewhere . . . Shell and Phillips pointed out that similar automatic custody systems already are being used successfully in other states and that they are being installed in Kansas without the necessity of a hearing.

The applications of the two firms were supported by Humble Oil & Refining Co., Sun Oil Co., Sun Pipe Line Co., Service Pipe Line Co., Gulf Oil Corp., Stanolind Oil & Gas Co., The Texas Co., Sinclair Pipe Line Co., Phillips Pipe Line Co., and Cities Service Oil Co. There were no dissenters.

Several of the larger companies besides Shell and Phillips have automatic lease production systems operating in Texas fields. If the two pioneer projects are permanently approved following the trial period, many of these firms are expected to go quickly to automatic custody.

Louisiana Allowable Cut

BATON ROUGE.—Louisiana's oil-production allowable for September has been set at 744,199 bbl. daily, a reduction of 2,630 bbl. from the August level.

Conservation Commissioner John B. Hussey said the recently announced cut in offshore allowables will amount to 17,163 bbl. daily, slightly less than had been forecast *(The Oil and Gas Journal, August 20, page 102)*. Offshore wells this month will be allowed only 94,378 bbl. daily, compared with 111,541 bbl. in August.

As a result of the lower offshore allowable, inland wells will gain 14,533 bbl. daily.

Citronelle Gets Outlet

MOBILE, Ala.—A gathering system and 8-in. pipeline has been completed to move crude from Citronelle field, one of the major discoveries of recent years.

Built by Gulf Oil Co., the 33-mile line is moving Citronelle crude to Gulf's terminal at Mobile. From there, the crude will go to refining centers either on the Gulf Coast or the Eastern Seaboard, as needed.

Before completion of the line, Gulf had been trucking more than 3,500 bbl. of crude daily to its dock facilities here. Capacity of the line is estimated at 28,000 bbl. per day *(The Oil and Gas Journal, June 11, page 97)*.

Discovered about a year ago, the field now has 35 producers. It is producing more than 5,000 bbl. of oil per day, well above total output for the remainder of the state.

Pipeline Contracted

Work to start next month on gas line to Los Angeles

LOS ANGELES.—Construction will begin next month on a 241-mile, 30-in. natural-gas pipeline from Newhall on the outskirts of Los Angeles to Topock on the California-Arizona border.

The $24,000,000 project contract was awarded to R. H. Fulton & Co. of Lubbock, Tex., by Southern California Gas Co. and Southern Counties Gas Co.

A 49-mile pipeline from Newhall to nearby Alhambra is under construction as part of the $33,500,000 program designed to bring an additional 278.2 million cubic feet of gas daily into Southern California. The Newhall-Alhambra phase is expected to be finished by December 1, and the Newhall-Topock segment June 30, 1957.

At Topock, the new line will connect with El Paso Natural Gas Co.'s line from the San Juan basin.

Work schedule . . . Fulton crews will begin right-of-way work, grading, and trenching in October. Pipelaying is expected to start next January. The pipe is being manufactured by Consolidated Western Steel at its Provo, Utah, plant.

The Newhall-Topock line will cross desert except for a 40-mile mountainous stretch from Newhall to Palmdale on the edge of the Mojave desert. Crews will be faced with hardrock conditions most of the way, including a mile-wide strip of lava from the Pisgah crater between Victorville and Ludlow.

Three river crossings will be made. In addition to the Colorado River crossing at the eastern terminus of the line, 650-ft. span will cross the Santa Clara River near Newhall, and a 400-ft. span will cross the Mojave River north of Victorville. All will be suspension bridges.

Drill Barge Migrates

First Gulf-type platform will work off California

LOS ANGELES. — California's first Gulf-type mobile drilling platform arrived in Los Angeles last week following a 50-day voyage through the Panama Canal from Orange, Tex.

The platform was built in Avondale, La., and towed to Orange where caissons were loaded aboard for the trip to California. The caissons and drilling equipment will be installed at the Los Angeles Shipbuilding Yards in Wilmington. The barge will be ready to go to work in October, according to Offshore Construction Corp., owner of the vessel.

The first project for the floating rig will be core-hole and confirmation work on a 1,280-acre offshore lease a mile off Huntington Beach. The lease is jointly held by Monterey Oil Co., Humble Oil & Refinery Co., and Seaboard Oil Co. Monterey is operator. If the preliminary work is encouraging, the three-company group will build an artificial island to develop the lease.

Monterey, as operator for itself and The Texas Co., is using an artificial island to develop a tidelands lease 1½ miles off Seal Beach. Monterey has completed 13 wells from the island.

There are indications that California is due for more offshore activity. Offshore Construction has applied for a 1-year option to lease 120,000 sq. ft. of dock space at Port Hueneme near Oxnard. The space would be used for drilling platforms if tidelands activity is stepped up.

Alberta Output Hits Peak

CALGARY.—Alberta set a weekly crude-oil production record during the week ending August 25 when production averaged 461,890 bbl. daily. This total beat the previous record, set the previous week, by 24,985 bbl. daily.

The record was 116,857 bbl. a day higher than production for the same period in 1955.

Pembina field also set an individual record for the week August 25. Its daily average of 125,473 bbl. marked a production peak never before equaled by an Alberta oil field. Its previous week's figure was 112,765 bbl. daily.

Redwater field had the week's second highest total with 93,872 bbl. daily. Leduc-Woodbend had 64,552; Bonnie-Glen, 36,489; Fenn-Big Valley, 21,402; Wizard Lake, 15,413; Joarcam, 13,718; Golden Spike, 12,045; Joffre, 9,988; and Westerose, 8,469.

Pembina also led in production completions during the week with 20.

watching WASHINGTON

. . . with Bertram F. Linz

Any Limits to Offshore Limits? . . .

THE idea of developing the oil resources of our Continental Shelf, first broached about a decade ago, has had a chain reaction clear around the world.

The United States did not claim ownership of the shelf, but only paramount rights to its underlying resources. Other countries, however, have gone further and actually have extended their territorial limits. The underlying idea is to "protect"—actually to monopolize—the resources of the marginal seas.

A regular parade of countries has announced sovereignty far out to sea. Canada is the latest entrant. She is pressing for a 12-mile limit, a revision which would affect U. S. shipping and fishing on both our oceans.

The 3-mile limit was set originally as the distance a country could defend itself by gunfire from shore. Modern arms and now guided missiles have outdated that concept. So the extended limits are sought, not for defense but for exploitation.

Most of the great naval powers cling to the old limit. But Russia backs the 12-mile limit. Some countries would run their limits out 200 miles. Australia wants to protect its pearl fishing. Some of the Latin American republics have a whaling industry. Norway and South Korea claim wide waters to safeguard their fishing.

It's a very confused situation. Sooner or later it is likely to get to the United Nations. But in the meantime it could, and in the case of Norway did a few years ago, lead to international controversies.

Seeds of Crisis In Suez Traffic Snarl . . .

THE Middle East emergency committee set up to meet the Suez crisis may be called into action even if the canal is not closed.

A threatened shortage of pilots, slowing up traffic on the canal, could cut seriously into Western Europe's oil supply. In that event oil might be required from the Western Hemisphere to make up the deficit, necessitating the juggling of tanker routes.

The possible need for prompt action was indicated late last month. The Military Petroleum Advisory Board was asked by the Interior Department to make a quick survey of the additional crude in the Southwest that could be made available on the Gulf Coast in case of an emergency.

The emergency committee is preparing for any one or more of four possible developments: closing of the canal, cutting of the two Middle East pipelines, loss of both, or a slowing down of the canal traffic.

Any one of these is expected to bring into play the plan of action set up last month by the committee and approved by Attorney General Brownell. But officials in Washington, while preparing for the worst, still are hopeful the situation will be cleared up quickly and peacefully.

FPC Gets New Gas Contract Tangle . . .

THE Federal Power Commission is faced with a new issue. It has been asked to decide whether an independent gas producer can quit service to a pipeline on expiration of a contract to carry out an agreement for intrastate sale made in anticipation of that expiration.

In a case which clearly defines the issue, P. R. Rutherford, et al., made a contract with United Gas Pipe Line Co. in 1946 to supply gas from the Huff and Fagan fields in Refugio County, Texas. The contract ran for 10 years and was renewable thereafter annually. But it permitted either party to cancel on 90 days' notice after the original term.

Foreseeing expiration of this contract, Rutherford made an agreement in 1951 to sell his gas to the Industrial Gas Supply Corp. and Ship Channel Industries Corp. when the United contract could be terminated last month.

But in the meantime, the Supreme Court handed down its Phillips decision and the FPC ruled interstate service could not be halted without its consent.

Texas in for New Depth Mark

Gulf to take state's former record holder to 19,200 ft. in important Delaware basin test to the Siluro-Devonian

FORT WORTH.—Gulf Oil Corp.'s 1 P. G. Northrup in Reeves County may soon become the first well ever to hold the Texas drilling-depth record on two different occasions.

The deep test, 24 miles southeast of Pecos, set a short-lived state record of 18,609 ft. in August 1954 before it was temporarily abandoned 4 months later due to a seemingly hopeless fishing job.

Gulf now has filed application to reenter the hole and deepen it to 19,200 ft. If the well should reach this depth, it would again be the state's deepest hole.

That record is now held by Magnolia Petroleum Co.'s 417-A West Ranch about 2½ miles south of Vanderbilt in Jackson County. This well went to 19,060 ft. in August 1955. The Magnolia well displaced a Hunt Oil Co. dry hole in Pecos County, the 47 Elsinore Royalty Co., which was abandoned at 18,673 ft. in February 1955.

Gulf keeps trying . . . The resumption of drilling at the 1 P. G. Northrup will mark the second time Gulf has reentered the hole.

Drilling was halted originally at 16,696 ft. in May 1953. The rig was moved off location and the hole was temporarily abandoned. Gulf reentered the hole the first time in May 1954, took it to a record depth, then left it a second time in December 1954.

After setting the new depth mark, the wildcat experienced nothing but trouble. Two packers stuck in the hole during an attempted drill-stem test at total depth. All efforts to pull, wash over, or grind out the plugs failed. Washover pipe was lost in the hole at one time but was recovered.

Gulf backed up the hole 100 ft. to sidetrack. It ran into another fishing job when drill pipe twisted off near the bottom. The sidetracked hole was drilled to 18,566 ft.

The company then gave up its efforts to drill deeper, plugged back and tested noncommercial gas shows at around 12,750 ft., and finally moved off the hole.

Test important . . . At its total depth of 18,609 ft., it was believed the 1 Northrup was in the lower Mississippian sediments.

Gulf, in deepening the well, will be looking for the Siluro-Devonian. The test will be watched very closely by oil men.

It is located in the southeastern portion of the Delaware basin. Many geologists point to Delaware, along with the adjoining Val Verde basin to the southeast, as probably the most promising of the country's few remaining large and relatively untapped provinces for big oil production, excluding the tidelands.

The Gulf well could go a long way in inflating or puncturing present evaluations of the basin's prospects.

The mere fact that Gulf is reentering such a deep hole so full of junk is an indication of the project's importance. The company plans to back still farther up the hole and try to whipstock it around the two fish at total depth.

Contract on the project is slated to go to Parker Drilling Co.

Arizona Gets Second Strike

GALLUP, N. M.—Arizona has its second producing area.

Franco-Western Oil Co. last week brought in its 1 Navajo in Apache County. The discovery is 4 miles south of East Boundary Butte, where Shell Oil Co. completed the state's first commercial producer 2 years ago.

The new strike flowed 7,450 M.c.f. of gas per day on a ½-in. choke from the Paradox-Pennsylvanian. It is now shut in, and no plans for development have been announced.

Distillate flowed at the rate of ¾ bbl. an hour on final tests. Perforations were at 5,359-67 and 5,380-92 ft. The discovery is on a farmout from Shell. The new pool has been designated North Toh-Atin.

Company Earnings Rise

NEW YORK.—Oil companies earned 16 per cent more during the first half of 1956 than they did for the same period last year, according to a report compiled by Carl H. Pforzheimer & Co. of New York.

Forty-eight companies reported an aggregate net income of $1,800,822,000 for the first 6 monthe of 1956. This compares with 1955 first-half earnings of $1,552,587,000.

Increased consumption and higher average prices for refined products accounted for most of the jump in earnings. Demand again showed a larger increase than had been expected. Total demand for all oils was up 5.5 per cent, while the domestic demand rose 6.4 per cent.

The Bureau of Labor Statistics' wholesale petroleum price index averaged 117.6 for the 1956 half-year, up 5.4 per cent over the average of 111.6 per cent for the first half of 1955.

Refining Industry In $1-Billion Class

WASHINGTON.—Petroleum refining today is a billion-dollar-a-month business, it was disclosed last week by the Census Bureau.

An advance report on the industry placed 1950 shipments of refined products and lubricants at $11,873,576,000. In 1947 shipments totaled only $6,792,402,000, indicating a 78 per cent increase over the intervening years.

The 409 refineries counted in the 1954 census were 28 fewer than in 1947, but there was a 5 per cent increase in the number of employes and and 52 per cent increase in payroll.

Total employment was 153,200 in 1954 compared with 145,800 in 1947.

The annual payroll in 1954 was $816,800,000. The 1947 payroll was $535,800,000.

Processing Plant Going Up

ATTICA, Kans.—Magnolia Petroleum Co. has started construction of a new natural-gasoline plant in Spivey Grabs field of Harper and Kingman counties. The plant will process 40,000,000 cu. ft. of gas and produce 21,000 gal. of natural gasoline and 26,000 gal. of butane and propane per day.

Magnolia will operate the plant for itself and 29 other owner-producers in the field. Completion is expected in January. Contractor for the process section is Dresser Engineering Co., Tulsa.

The plant will process both casinghead gas from oil wells and dry gas from gas wells in the area. Residue gas will be sold to Kansas Power & Light Co.

FPC Reopens Little Inch Switch

SHREVEPORT. — Permit for Texas Eastern Transmission Corp. to switch the Little Big Inch line from natural gas to products service probably will not be issued by the Federal Power Commission until late fall at the earliest.

This contradicts recent rumors that a decision is imminent on reconverting the 20-in. pipeline from Beaumont, Tex., to Moundsville, W. Va.

The delay stems from court litigation and consolidation of the company's expansion proposals. The proceedings now involve two requests. They are:

. . . To import 115,000 M.c.f. of gas daily from Mexico and construct a 422-mile, 30-in. trunk line from McAllen, Tex., to Beaumont and 530 miles of 30-in. loops on existing lines.

. . . To convert 1,168 miles of the 1,479-mile Little Big Inch from gas to petroleum products.

Hearings already have been held on the Mexican proposal. Texas Eastern, however, was given until August 15 to file briefs with FPC. Any opponents had until August 31 for filing after which Texas Eastern has another 7 days for answers.

Hearings on the reconversion request have been scheduled for September 14.

The commission in June of 1955 authorized retirement of the Little Inch facilities. The case later was remanded to it for further proceedings by the U. S. Court of Appeals for the District of Columbia.

Time table . . . A decision on the Mexican phase of the double proposition is expected to come in September and clearance for the reconversion some time later in the fall.

Even if permission is given this fall for converting the Little Big Inch, actual products delivery probably will not start before next summer. Decisions regarding laterals will not be made until the permit is granted. Previously Texas Eastern indicated it is considering laterals to St. Louis and Pittsburgh and perhaps other points.

Big project . . . Work on the Mexican program could start almost immediately after FPC clearance.

This project promises to be one of the major construction jobs in the country for late 1956 and 1957. Estimated cost is $150 million. It involves laying 952 miles of 30-in. and 24-in. pipe. This includes 422 miles of 30-in. from Bidor compressor station near the Rio Grande to Beaumont and 530 miles of 30-in. loops along the existing line from Kosciusko, Miss., to Uniontown, Pa.

Discoveries Extend Edwards Lime Trend

SAN ANTONIO.—Another deep Edwards lime discovery was made last week in South Texas just as Lone Star Producing Co. was completing its strike 50 miles south of here.

The latest discovery is Amerada Petroleum Corp.'s 1 Ethel Lowe Craig 13 miles southwest of Tilden and 25 miles southwest of the Lone Star 1 Urbanczyk. Both are in southeastern Atascosa County, along the southwest extension of the Balcones fault trend.

Amerada's 1 Craig was drilled in the Lowe Ranch field, discovered in 1951. The lone well in the field, shut in since discovery, was completed as a gasser in the Wilcox at 5,475 ft. after being bottomed at 6,245 ft.

The 1 Craig flowed 20,000,000 to 30,000,000 cu. ft. of gas per day from open hole at 13,681-14,479 ft. through ¼-in. choke with tubing pressure of 4,900 psi. Tubing pressure was 5,300 psi. on 12/64-in. choke. Seven-inch casing was set to 13,681 ft. and the well was drilled to total depth of 14,479 ft. The well flowed after being acidized.

Lone Star strike . . . Final tests of the 1 Urbanczyk indicated open-flow potential of 36,000,000 cu. ft. of gas daily recovering 23.75 bbl. of 51.6°-gravity distillate per 1,000,000 cu. ft. When shut in the well had bottom-hole pressure of 5,177 psi. and tubing pressure of 3,986 psi.

Completion is in two 26-ft. casing-perforated intervals at 10,790-10,816 ft. and 10,824-50 ft. The well logged the top of the Edwards at 10,210 ft. (surface elevation 399 ft.) and was still in it at total depth of 10,921 ft. In this 711 ft. the well cored 580 ft. of fair to good porosity and 69 ft. of poor porosity.

The discovery is at the farthest coastward location that the Edwards lime has produced so far. Nearest Edwards production is at Muil field, 10 miles northwest and inland. Pleasanton field, 15 miles to the northwest, produces from the same pay. These fields are about 30 miles from other Edwards production along the southwest extension of the Balcones fault trend.

Pipeline BRIEFS

ABILENE, Tex.—Cosden Petroleum Corp. last week dedicated its new products line connecting its 27,000-bbl. Big Spring refinery and its new terminal here. The terminal will serve the Abilene Air Force base and provide products to meet civilian demands in the area. Products to be moved include regular and premium gasoline, jet fuel, diesel fuel, and kerosine.

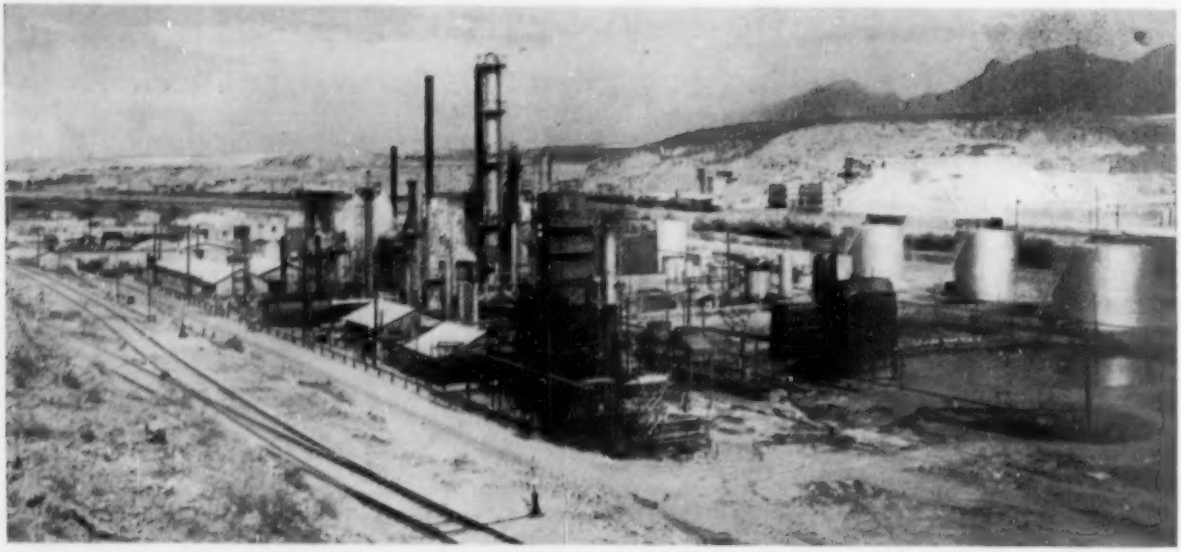
CORPUS CHRISTI.—Suntide Pipe Line Co. has taken a 3-year lease on properties of Logco Pipe Line Co., an affiliate of Luling Oil & Gas Co., with an option to purchase. Logco properties are located in Bee and Karnes counties. Logco has been buying about 2,500 bbl. of crude daily, and Suntide has been taking this for movement through its new 8-in. line from Refugio to its Pettus tank farm and pump station.

CHEYENNE, Wyo.—A second application for permission to build a 6-in. pipeline to serve Donkey Creek field in Crook County, Wyoming, is being considered by the Wyoming Public Service Commission. R. H. Fulton, pipeline contractor of Lubbock, Tex., filed the latest application. Powder River Pipeline Co. filed the earlier request.

WASHINGTON.—The Federal Power Commission will reopen hearings October 15 on the question of who will build natural-gas pipeline facilities to supply Natural Pipeline Gas Co. of America. The Chicago firm has applied for permission to build its own lines to tap the market in Jack and Wise counties of Texas. But Lone Star Gas Co. has appealed with a claim of "invasion." Lone Star wants to build lines to supply Natural Gas Co. and protect its supply source *(The Oil and Gas Journal, August 8, 1955, page 78).*

Also for Pipeliners . . .

First automatic custody transfer system in Texas is approved . . . Contract let for big-inch California gas line . . . And Citronelle field gets an outlet (P. 68) . . . El Paso Natural, already a big name in pipelining, makes great strides toward becoming an integrated oil company (P. 72) . . . FPC permits issued in past year assure continued boom in gas-line construction (P. 74) . . . A technical article detailing how a big-inch mountain gas line was cleaned (P. 114) . . . And construction tables (P. 134).



BIG REFINING PUSH of El Paso Natural was launched with purchase of Brickland plant less than a year ago. Capacity boost followed.

El Paso Moving Toward Integration

● In less than a year this pipeline company has bought three refineries, made plans for two more, and is going into petrochemicals. Behind it: A big volume of L.P.G.

Robert J. Enright
Southwest District Editor

EL PASO, Tex.—El Paso Natural Gas Co., a southwestern pipeline giant with drilling and producing activities, is making almost unbelievably fast progress in its drive to become a large refiner and marketer as well.

El Paso made its first move in this direction less than a year ago when it bought out McNutt Oil & Refining Co. of El Paso last October.

The purchase netted the company a 3,200-bbl. refinery just outside El Paso at Brickland, N. M., seven terminals, 125 retail outlets, and a lot of processing know-how in Cecil E. McNutt, president of the purchased firm, and his technicians. Since then, fast-moving El Paso has:

. . . **Bought two more small plants** at Prewitt and Bloomfield, N. M., from Malco Refineries, Inc., and has revamped them and expanded their capacities.

. . . **Revealed plans** for a "larger-than-6-in." products line from the Odessa area in West Texas to El Paso, a distance of 240 miles; an alkylation plant somewhere along the route of this line; and a plant at El Paso which would blend the alkylate with motor gasoline from the Brickland refinery into a high-octane premium motor fuel.

. . . **Announced construction** of a new 6,500-bbl. modern refinery east of Gallup, N. M. Design of this plant will permit a fast and substantial hike in capacity when desired. Due for completion next fall, it will hike the firm's refining capacity to roughly 16,000 bbl.

. . . **Plunged into petrochemicals** manufacturing in a joint project with General Tire & Rubber Co. and others to build a huge synthetic-rubber complex at Odessa, Tex.

. . . **Formed a new firm,** El Paso Natural Gas Products Co., to coordinate and ramrod all of its processing activities.

El Paso's decision to jump into the processing and marketing end of the industry stemmed from a long study carried out by company officials on the marketing of L.P.G. and natural gasoline produced with its natural gas.

El Paso's output of these products comes to a whopping 25,000 bbl. a day. And the company was constantly plagued with establishing a stable, year-round market for these products. The problem was intensified by the drastic drop in demand for heating fuels during the summer season.

El Paso hopes eventually to refine essentially all of its 25,000 bbl. of L.P.G. and natural gasoline. It will continue to meet the needs of its existing home-heating and other markets with a sharp expansion of capacity and number of its natural-gas processing plants.

Full steam ahead . . . El Paso was moving ahead fast last week on all fronts. The company has completed revamping and expanding capacity of its refineries at Brickland and Prewitt. Capacity has been pushed up from 4,000 to 4,500 bbl. daily at Brickland and from 3,000 to 4,000 at Prewitt.

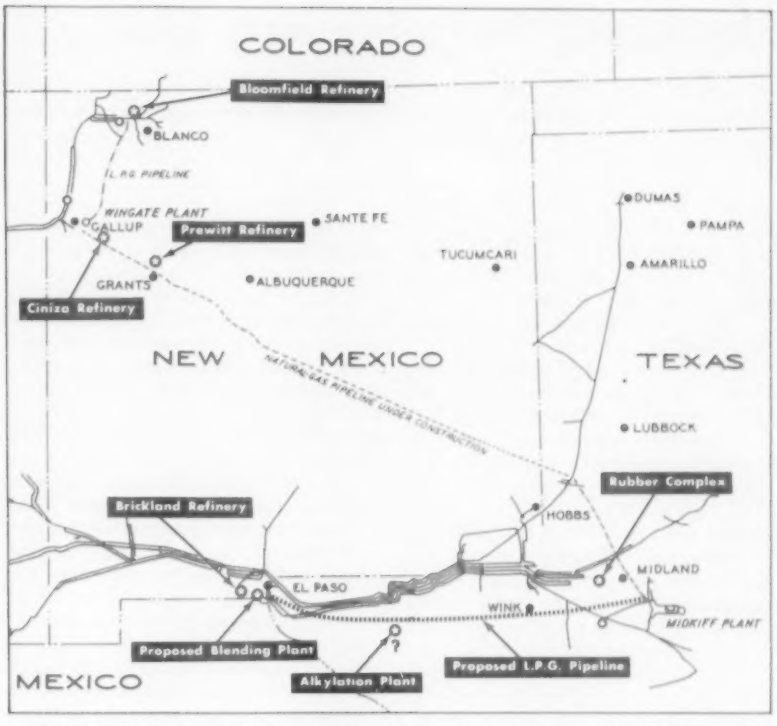
The Prewitt plant, 45 miles east of Gallup, N. M., near Grants, produces regular and premium gasoline, kerosine, diesel fuel, and fuel oil. It obtains crude oil through a 90-mile, 4-in. pipeline from Doswell, Blanco, Hospah, Jicarilla, and Barker Dome fields in extreme northern San Juan County. Oil also is trucked in from as far away as the southeastern corner of Utah and northwestern Arizona.

The plant has a 1,000-bbl. thermal cracking unit, a 750-bbl. Platforming unit, and polymerization facilities along with its distillation capacity.

The facilities at the Brickland refinery are roughly equivalent. It has a 1,500-bbl. thermal cracker, a 600-bbl. Platformer, and a poly unit. The Brickland plant gets its crude from the Snyder area in West Texas through Pasotex Pipeline Co.'s line to El Paso. The oil is trucked across El Paso to the refinery.

Major products at the plant include three grades of motor fuel, JP-4 jet fuel, kerosine, diesel fuel and distillates, and No. 6 fuel oil which is exported to Mexico.

When the company completes the planned products line from the Odessa



DOUBLE-BARRELED refining-marketing drive centers in this Texas-New Mexico area.

area to El Paso, it will take the bulk of its oil from this area rather than from Snyder.

The projected alkylate plant on the line between Odessa and El Paso will make alkylate from natural gasoline supplied mainly by the company's huge Midkiff natural-gasoline plant in Spraberry field. The alkylate will be pumped on through the line to El Paso and blended in a new plant there with Brickland motor fuel. The resulting premium fuel, El Paso claims, will have an octane rating as high or higher than any in the country.

El Paso also plans to add new facilities at the small Bloomfield topping plant 15 miles east of Farmington, N. M. This plant processes about 1,000 bbl. daily of pipeline "drip" or condensate from Blanco field, most of it rating 50° gravity or above and requiring little refining. Some of the condensate is reported to yield as much as 85 per cent gasoline.

The plant separates out the heavier ends of the distillate—kerosine, wax, and paraffin.

Biggest step yet . . . El Paso's biggest step yet toward becoming a large refiner, however, was its decision to build the new refinery east of Gallup.

The site for this plant originally had been spotted 10 miles east of Gallup, adjoining the firm's Wingate natural-gasoline plant. But the company has changed its mind and will build at Ciniza, 17 miles east of Gallup. The site is just off U. S. Highway 66 and adjoins the Santa Fe Railroad main line.

Facilities will include the latest in crude distillation, vacuum, catalytic cracking, alkylation, and Platforming units. All process units will be of Universal Oil Products Co. design. Construction contract, has been let to Southwest Engineering Co., Los Angeles. Construction work is scheduled to begin September 15.

The products company has arranged to buy from El Paso Natural Gas a 6-in. products line extending 96 miles from the company's Blanco natural-gasoline plant south to Wingate. The line will be converted to crude service and extended to the Ciniza plant to bring a crude supply from San Juan basin fields.

Basin oil production was negligible not long ago. Recent strikes and subsequent development indicate, hov ever, that El Paso may need to hike capacity of the new refinery almost before it is completed in the fall of 1957.

Mushrooming development in one field alone, Bisti-Black Rock in San Juan County, indicates the plant will have no trouble in rounding up sufficient crude.

The huge strat trap already promises a producing area of at least 40,000 acres. The discovery was made by El Paso's 1 Kelly-State last year, but British-American Oil Producing Co.'s 1 Marye 4 miles to the northwest this spring was the well which touched off the big drilling play.

PREWITT PLANT gets facelifting. It's one of several now in El Paso Natural fold.

The fe'd lies just a few miles to the west of the 6-in. line from Blanco to Wingate.

Along with this line, the products company has decided to build a 4-in. line from its Wingate natural-gasoline plant to the Prewitt refinery 38 miles to the east. Contract for construction of this line has not yet been let, but work is slated to begin in mid-Septem-

ber. Route of the line takes it past the Ciniza plant site.

San Juan basin crude and Wingate plant products will be delivered to Prewitt until the Ciniza plant is completed, then part or all of the flow will be diverted to the new refinery.

A new marketer, too . . . El Paso plans to market the bulk of its products through its own retail outlets.

The 125 retail outlets acquired through the McNutt purchase are located in Texas, New Mexico, and Arizona.

The company will open other stations soon in the San Juan basin area and, later, in other areas of New Mexico, West Texas, and Arizona.

Storage terminals will be built in strategic locations throughout the three-state area. The company has indicated, too, that it may decide to market in still other states.

Petrochemical progress . . . On the petrochemical front, El Paso Natural Gas Products, together with United Carbon Co. and Odessa Natural Gasoline Co., under the name Odessa Butadiene Co., has kicked off construction of a 50,000-ton-per-year butadiene plant near Odessa.

Foundations already are going in at a site 2 miles northwest of the city, and erection of process units will be started soon. Construction contractor is Fluor Corp. The plant will supply butadiene raw material to an adjoining General Tire & Rubber Co. plant, also under construction, which will produce 40,000 tons a year of synthetic rubber.

El Paso also holds a contract to supply styrene, another feed stock needed for rubber making. It has not yet announced whether it will build a plant to make the styrene at Odessa or ship it in from the Gulf Coast.

All told, the rubber complex will cost its builders roughly $32,000,000. It is slated for completion next July.

The men at the wheel . . . Three top men are directing and coordinating the new products company's rapid-fire drive. They are:

Paul Kaiser, president of El Paso Natural Gas Co., and head of the products company; C. L. Moore, formerly assistant general superintendent of the gas company, now vice president and general manager; and Cecil E. McNutt, former president of the old McNutt Oil & Refining Co., now vice president and operating manager of refineries.

Today, El Paso Natural Gas Co. still has a long way to go before it becomes a large-scale refiner and marketer of oil products. But indications are that it is moving fast in that direction.

Flemming Asks Imports Slash

WASHINGTON.—Oil importers are being asked by the Government this week to make a sharp cutback in fourth-quarter schedules.

The voluntary program will be continued, at least through the last quarter, Mobilization Director Arthur S. Flemming disclosed. But whether it will go beyond the end of the year will depend apparently on three things:

. . . How well the importers conform to requests to cut back.

. . . A decision next month by the cabinet fuels committee on whether the 1955 formula should be changed.

. . . A hearing later on the plea of 19 domestic producer associations for forced cutbacks.

Sharper cut . . . Flemming indicated that the fourth quarter cut may be considerably sharper than the 4 per cent (90,000 bbl. daily) the companies were asked to reduce their imports in the current quarter.

No figures have been released by the ODM on actual imports so far this quarter. But there is a general belief that the cut will be only half or little more of the amount asked.

The letter going out to the importers from ODM is expected to ask that final quarter imports be cut back to a point where the average for the last half of the year will approximate that for the first 6 months.

With Canada and Venezuela imports not counted, and imports into the Pacific Coast exempt from restriction, burden of the cutback will fall on crude oil from the Middle East.

New study . . . The cabinet committee's task force, meanwhile, is winding up its new study of the 1955 formula.

It is not expected to file a formal report. Instead, Flemming said he will arrange a meeting between the task force and the cabinet committee, probably around the middle of this month. The review of the situation will be followed by the committee's descision on what to do about it.

There is little doubt in Washington that the cabinet committee will have to do something. It may hold that the 1955 formula, calling for maintenance of imports in the same relation to domestic production they held in 1954, should be changed in the light of new conditions.

But it may hold that the 1955 formula is still good. That would be a declaration that imports now are excessive, supporting the claims of the domestic producers.

There is some question, however, whether the committee would go that far. It would be an invitation to application of the national security clause, something the administration is anxious to avoid.

4,400 miles added last year . . .

. . . No Letup in Pipeline Boom

WASHINGTON. — The natural-gas pipelines are running like mad in a breathless race to keep pace with user demand.

Permits issued by the Federal Power Commission during the fiscal year ended last June 30 call for addition to the nation's gas-supply system of nearly 4,400 miles of line and some 255,000 hp. in compressor units at an estimated cost of over $461,400,000. This was only slightly less than the 4,900 miles and nearly 260,000 hp. approved in the previous fiscal year. The 1955 construction cost $465,300,000.

The new construction, however, will add more than 2.25 billion cubic feet daily to delivery capacity, against 1.75 billion in the preceding year, the FPC reported last week.

Completion of these facilities will bring the investment in natural-gas pipelines over the $5-billion mark, to an estimated $5.3 billion, FPC said.

Since certificate control went into effect in February 1942 nearly 69,000 miles of pipeline and over 4,600,000 compressor horsepower have been authorized by the FPC, adding nearly 26 billion cubic feet of capacity to the few systems then in operation.

Major projects costing $700,000 or more each accounted for $444,000,000 of the $461,400,000 authorized in the last fiscal year. These provide for 3,700 miles of pipeline and nearly 247,000 hp. and will add more than 2.18 billion cubic feet daily to consumer supply in 170 large cities and many smaller communities in 31 states.

El Paso Natural Gas Co. received the largest single authorization. It covers 413 miles of 34-in. main loops in New Mexico and Arizona, 132 miles of supply laterals in Texas, and 60,610 hp. in new and existing stations. Estimated to cost $184,603,000, the project will increase El Paso's capacity by 455,000,000 cu. ft. daily for service primarily to California customers.

Tanker Demand Stronger

Suez crisis boosts tanker prices; more supertankers are ordered; but U. S. trade-in-and-build program is slipping

NEW YORK.—Uncertainty over the future control of the Suez Canal has had a definite effect on the American tanker market.

The estimated 42 per cent boost in tanker tonnage that would be needed if the canal were closed gave an already strong tanker market new vigor.

Tankers that were sold a year ago for $1,200,000 are bringing almost $3,000,000. There are few such sales. Tanker operators are not eager to dispose of tonnage. Old tankers slated for scrapping with this year's usual summer slump are still in service and probably will be for sometime.

The growing trend toward building huge tankers which couldn't travel the canal can't be chalked up to the Suez crisis. This move was under way long before Col. Gamal Abdel Nasser issued his nationalization order.

The program of building big tankers can't be accelerated much, either. The world's shipyards, particularly those outside the United States, are booked solidly for several years.

More big tankers . . . National Bulk Carriers, Inc., which recently launched the world's largest cargo vessel, the 84,700-ton Universe Leader, plans even bigger tankers.

D. K. Ludwig, president of the New York shipping firm, was reported last week to have asked the Japanese Government for permits to build four 87,000-ton tankers in Japan. Ludwig said, however, it would be up to the Japanese Government, from which his company leased the Kure shipyard, to make any announcement about orders.

Ludwig said his company has no plans to build any more "small" tankers. Universe Tankships, Inc., the Ludwig affiliate which operated the Kure yards, is now building a sister ship to the Universe Leader, two 87,000-ton "ore or oil carriers," and two 42,000-ton tankers.

U. S. program languishes . . . Interest in the government's trade-in-and-build tanker program is falling off, a high official admitted last week.

Economic conditions for tanker operation have become so favorable within the last 18 months that owners are financially better off to keep vessels in operation rather than to take advantage of the trade-in allowances, it was explained.

The trade-in program is one of three devices adopted by the Government in an effort to increase the size of our tanker fleet. The trade-out-and-build program has been of real interest. Since 1951, the Maritime Administration has authorized the transfer of 46 tankers to registry in Panama, Liberia, Honduras, or Venezuela in exchange for the building for U. S. registry of 16 new tankers of at least equal carrying capacity.

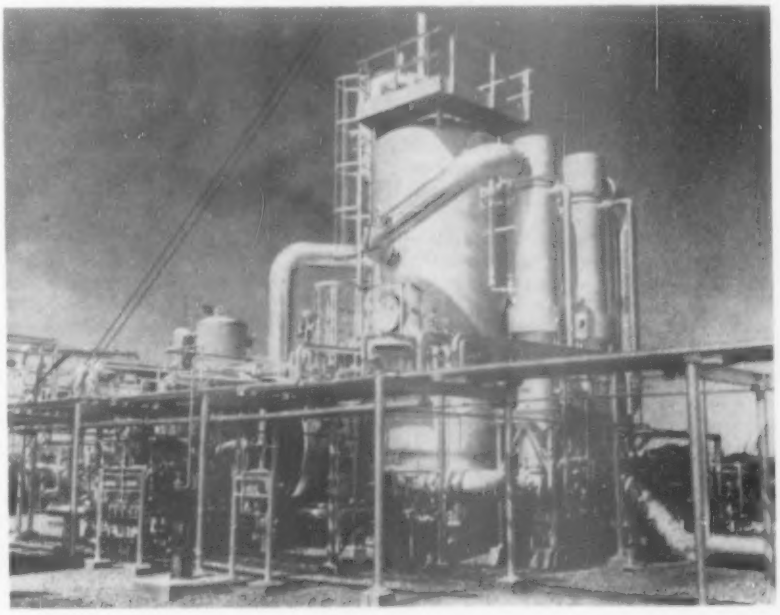
U. S. tanker fleet . . . A review of the tanker situation by interested government agencies shows that as of June 30 the active commercial fleet consisted of 338 ships with a total of 5,667,000 deadweight tons. Eighteen T-2 tankers, totaling 298,200 tons, were in the national defense reserve fleet August 15. Twelve commercial vessels of 399,050 tons are under construction or due for delivery before the end of next month.

To this total of 368 vessels of 6,364,250 tons, ships that might be considered as supplementary in case of an emergency total 237 with 4,434,019 tons. The latter are under foreign flag: Panama, 126 totaling 2,216,015 tons; Liberia, 92 totaling 2,070,142 tons; Honduras, 3 totaling 40,303 tons; and Venezuela, 16 totaling 107,559 tons.

In addition, there are 59 tankers, totaling 1,007,500 tons, operating or under construction for the Navy, not including commissioned fleet oilers. This group includes 47 active tankers totaling 775,500 tons, 8 in the naval reserve fleet, totaling 132,000 tons, and 4 under construction, totaling 100,000 tons.

The total tanker fleet available to the U. S. at the moment is 648 vessels with a total of 11,306,719 tons. By the close of September 1957, it is estimated, the fleet will rise to 664 vessels totaling 11,805,769 tons.

No construction or operating subsidies have been granted to tankers. Legal authority for construction subsidies exists for vessels in foreign trade.



New Sulfur Plant Utilizes Flare Gas

BILLINGS, Mont. — Montana Sulphur & Chemical Co. has started up its new sulfur-manufacturing plant with a capacity of 40 long tons daily.

Montana Sulphur & Chemical is producing elemental sulfur from hydrogen-sulfide gases which Carter Oil Co. and Continental Oil Co. formerly flared or burned at their Billings refineries.

Badger Manufacturing Co., Cambridge, Mass., designed and engineered the manufacturing plant, whose output is sold primarily to West Coast pulp and paper industries. The recovery plant was engineered by Proctor Engineering Co., Tulsa. Estimated cost of the sulfur plant was almost $500,000.

Peace River Gets Set

Pacific Petroleums buys refinery interest, government proposes rail link as area girds for increased activity

CALGARY.—Pacific Petroleums, Ltd., has moved further into the Peace River petroleum picture. The firm purchased a major interest in X-L Refineries of Dawson Creek, the first to process crude from British Columbia's only commercial oil reservoir.

The 3,000-bbl. refinery, only a few months old, also sells gasoline and diesel fuel through its own dealer organization in the Peace River area. It's a first step for Pacific Petroleums into the gasoline-retailing business, but the firm said it has no plans to expand this phase of its operations.

Pacific Petroleums is building an $18 million gasoline-processing plant at Taylor Flats on Peace River near St. John (*The Oil and Gas Journal, March 30, page 91*). Operations of the two plants will be integrated.

The gasoline plant will clean natural gas from Peace River fields before it enters the pipeline of Westcoast Transmission Co., Ltd. It will produce propane, butane, natural gasoline, sulfur, and liquid hydrocarbons. Initially, it will extract 250 to 300 tons of sulfur a day.

The refinery will serve a substantial market along the Alaska Highway and the fertile Peace River valley. And the market is expected to grow.

Rail extension proposed . . . British Columbia has proposed a 250-mile extension of its Vancouver-to-Prince George railroad. The extension would run to Fort St. John and then to Dawson Creek, where it would connect with an existing line from Alberta.

With the Westcoast project under way, petroleum reserves in the Peace River area are expected to rise rapidly. Major companies have 27 seismic crews at work in the area—the biggest number so far.

The Westcoast line will be 650 miles of 30-in. pipe stretching from the Peace River area to Vancouver and over to Sumas, on the Washington-British Columbia boundary. Installation cost, excluding cost of materials, is estimated at $31,564,000. Contractors are getting $7.85 to $13.12 per foot.

Peace River reserves are located 55 per cent in British Columbia and 45 per cent in Alberta. Some 75 per cent of gas reserves in the area are sour. Arrangements have been made with Jefferson Lake Sulphur Co. interests to buy the acid stream from Westcoast Transmission's processing operations. Jefferson Lake will build a sulfur plant nearby.

Gas reserves . . . Gas reserves in the Peace River area now approach 4 trillion cubic feet. Some 2.7 trillion feet is controlled by Pacific Petroleums, which will be the principal supplier of the Westcoast line.

Prices to producers have been set tentatively at 6 cents per M.c.f. until January 1, 1958, and 10 cents per M.c.f. for the following 5 years. It will then increase gradually to 12½ cents for the eighteenth, nineteenth, and twentieth years.

An exception is the contract with Imperial Oil, Ltd., which will get 5.75 cents per M.c.f. to start, with a steady increase to 11.98 cents in the nineteenth year.

Westcoast plans to move 3,000,000 cu. ft. daily of the gas during 1957 and increase this to 400,000,000 cu. ft. a day by 1958. Ultimate capacity is set at 650,000,000 cu. ft. daily.

Colorado Gets New Area

DENVER.—Sedgwick County in the far northeastern corner of the Colorado portion of the Denver-Julesburg basin added its third producing area last week.

The discovery well is Texota Oil Co.'s 1 Ricker, 8 miles southeast of Marks field, a "D" sand gas producer.

Texota's discovery well flowed 2,750 M.c.f. of gas per day from the Dakota "D" sand at 3,648-54 ft. The 1 Ricker marks the second completion in a 10-well program through this all-but-barren portion of the basin. The first well was dry. Texota has set surface casing at the third, the 1-A State in 4-9n-57w.

Union Ponders Strike Vote

BAYTOWN, Tex.—Members of the Baytown Employes Federation will decide September 11 whether to call a strike vote against Humble Oil & Refining Co. If approved, the strike vote would be scheduled on a later date.

The independent union, with a membership of nearly 3,000, represents about 4,200 workers at Humble's refinery here. Negotiations for a new contract have been under way since last spring.

If the union walks out it would be its first strike since the organization was established nearly 20 years ago.

Allowable Slashed

Commission deflates boom in Pierce Junction field

HOUSTON.—Top production allowable in the booming Pierce Junction field has been cut 35 per cent for September.

The Texas Railroad Commission last week reduced the maximum per-well allowable from 140 bbl. to 91 bbl. daily.

The new order threatens to slow the drilling spree which has resulted in completion of more than 200 wells in the revived field so far this year. The city of Houston, which last week had a second well on its 300-acre Holmes Road garbage dump, has been forced to lower its estimate of revenue from its 25 per cent royalty interest.

Under the new proration schedule the city can expect a maximum of about $25,000 annually from each well on the dump as compared to an earlier estimate of about $38,000. The city hopes eventually to have 30 wells gracing the garbage heap.

On the September proration schedule the Railroad Commission lists 244 producing wells in Pierce Junction with a total allowable of 15,839 bbl. daily. Maximum allowable was given 140 wells in the field.

Because of rapid development, the field's total output will be cut relatively little. In August, the commission set the allowable at 17,880 bbl. daily for only 211 wells.

Discovered in 1921, the field was revived with a new pay sand discovered late in 1954. Since the field is on a salt dome normal spacing regulations do not apply.

Humble Flood Approved

AUSTIN.—The Texas Railroad Commission has approved Humble Oil & Refining Co.'s plan to unitize and water flood the Jackson sands under more than 1,000 acres in Raccoon Bend field of Austin County on the Texas Gulf Coast.

The project takes in the entire graben area of the field. It calls for water injection into both the Gutowsky and Grawunder sands of the Jackson series.

The old field has produced about 13,000,000 bbl. of oil since its discovery in 1928. Humble thinks the water flood will ultimately double this volume.

Humble owns all leases in the unit, which now has 21 producing wells. The company will use three input wells in each pay and inject about 360 bbl. of water daily per well in a line-drive type flood plan.

Alberta Imports Dip

September nominations run 26,748 bbl. below August

CALGARY.—Alberta crude purchasers have made nominations totaling 420,927 bbl. for September. This is 26,748 bbl. less than the all-time record of 447,711 bbl. set in August.

Refineries in the United States have asked for 98,892 bbl. daily, with Shell Oil Co.'s Anacortes plant being the major bidder. Shell requested 43,000 bbl. daily. This is 3,000 bbl. more than the August bid for the refinery, its first since the strike which kept it shut down for 120 days.

Other U. S. bidders and their nominations are:

General Petroleum Corp., Ferndale, Wash., 22,527; International Refineries, Wrenshall, Minn., 11,670; Great Northern Oil Co., Pine Bend, Minn., 5,800; Bay Refining Corp., Bay City, Mich., 5,000; Northwest Refining Co., St. Paul, Minn., 3,000; Dow Chemical Co., Midland, Mich., 1,170; West Branch Refineries, Inc., West Branch, Mich., 1,170; and Union Oil Co. of California, Cut Bank, Mont., 225.

Imperial Oil, Ltd., continues to lead all bidders with a monthly nomination of 143,495 bbl. for its western Canadian and Ontario refineries, and 14,600 bbl. daily as line fill from Trans Mountain Pipe Line Co. and Interprovincial Pipe Line.

British American Oil Co., Ltd., nominated for 49,030 bbl. daily. Shell Oil Co. was third highest with its 43,000-bbl. bid for Anacortes. Shell also asked 16,670 bbl. daily for its Shellburn, B. C., refinery placing its total for U. S. and Canadian plants at 59,670.

Ontario will be the largest user of Alberta crude in September, with 115,525 bbl. going to that province daily.

Alberta refiners will use 71,230 bbl. daily; British Columbia, 64,090; the U. S. Pacific Northwest, 65,752; Saskatchewan, 41,585; U. S.-Lakehead-Midwest, 33,140; and Manitoba, 14,155.

Deepest Well Gets Stepout

PORT SULPHUR, La.—Richardson & Bass was drilling below 18,200 ft. last week in what may become the second deepest well ever drilled.

The test is an attempt to confirm production established earlier this year at a wildcat drilled to the record depth of 22,570 ft. The record holder, which produced from two intervals between 21,419 and 21,465 ft. is the 1-L Humble-L.L&E. Associated with Richardson & Bass in both wells are John W. Mecom and Freeport Sulphur Co. *(The Oil and Gas Journal, May 14, page 101).*

The stepout, about 2 miles east of the record holder, is the Humble Oil & Refining Co., R. F. Price, et al, No. 1 State Lease 2345, in Plaquemines Parish. Richardson & Bass is deepening the hole which originally was abandoned in 1954 at about 11,500 ft.

Canadians Dominate Oil Jobs

CALGARY.—The Canadian Petroleum Association reports a survey it made of 36 Canadian companies shows only a small fraction of their employes are Americans.

The survey included 23 oil companies, seven service stations, and six drilling contractors. They employed 10,794 persons with only 369 or 3.42 per cent being Americans. The oil companies employed 96 per cent Canadian help and 4 per cent American. Drilling contractors had the lowest percentage of Americans — only nine Americans out 1,332 employes for 0.98 per cent.

Companies with highest percentage of American employes were Sinclair Canada Oil Co. with 52.63 per cent; Phillips Petroleum Co. with 34.21 per cent; and Canada-Cities Service Petroleum Corp. with 28.57 per cent. But these firms only employed 19, 38, and 21 persons respectively.

The association said this is the employment pattern usually followed in Canada. U. S. companies entering Canada at first have a high percentage of Americans. With growth, new jobs are created for Canadians; and subsequently the percentage of Americans drops sharply.

Fight to Kill Well Resumed

ABBEVILLE, La.—Drilling was scheduled to resume late last week at an offshore relief well through which Union Oil Co. of California hopes to kill a wild gasser which has been shooting flames into the air for more than 2 months.

At last report the operator was fishing for drill pipe which became stuck in the hole at 7,249 ft. *(The Oil and Gas Journal, August 27, page 74).* Most of the fish had been removed at midweek.

Top of the directional hole is about 1,500 ft. from the blowout, in Block 26, Vermilion area. A spokesman for the operator said the flow of gas had greatly diminished since the well blew out early in June.

Plans call for tapping the wild well just below the protection casing at about 10,500 ft.

Tidelands Bid Fails

Court rejects new approach to drilling rights by Apco

WASHINGTON.—The Louisiana tidelands dispute was in and out of federal court last week as Anderson-Prichard Oil Corp. unsuccessfully tried a new approach to resumption of drilling activities in the twilight zone.

The company filed suit to force Interior Sec. Fred A. Seaton to sign a stipulation, already signed by Louisiana authorities, to permit the firm to resume drilling. A Supreme Court injunction prevents new drilling starts in the disputed area without an agreement between state and federal officials.

The motion, however, was dismissed by Judge Edward M. Curran, who ruled that the question was "a discretionary matter and not subject to judicial review." He said the court could not interpret nor modify the Supreme Court order.

The objections . . . Justice Department Attorney Thomas L. McKevitt told the court that the government is willing to enter into an agreement with Louisiana covering all leases. But he argued that an agreement with a single lessee would prejudice the government's case and discriminate against other companies.

Anderson-Prichard disclosed that it is paying rental on the lease to both Louisiana and the U. S. In addition, it is paying $4,400 a day on a drilling contract in which the company agreed to provide a location by July 24. It valued the lease at $4,500,000.

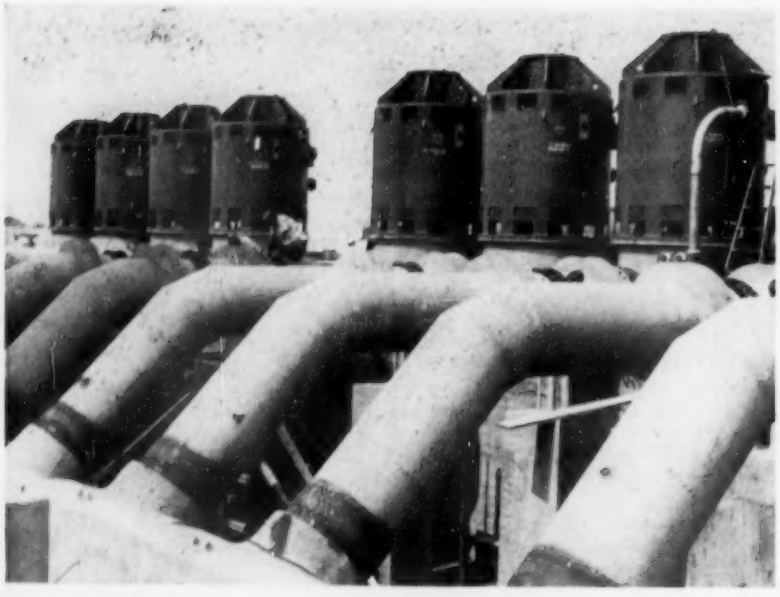
Anderson-Prichard's court action followed a refusal by Supreme Court Justice Hugo Black to grant the firm relief from the Supreme Court injunction *(The Oil and Gas Journal, August 27, page 64).*

Gulf Finals Prolific Well

PURCELL, Okla.—The most prolific discovery area of the year in Oklahoma added its second dually completed well last week.

Gulf Oil Corp. completed its 1 Baxter in new East Criner field, McClain County, for 528 bbl. of oil per day from the Hunton lime at 8,970-9,000 ft. and 2,328 bbl. per day from the first Bromide sand at 10,050-10,195 ft. This well also had commercial shows in the second Bromide and Tulip Creek sands. Gulf has its third well under way.

East Criner field was opened in May at the 1 Cora Dyer. That well flowed 1,832 bbl. per day from the Hunton at 8,955-97 ft. and the Bromide at 10,100-10,200 ft.



River Torrent to Cool Tidewater Plant

DELAWARE CITY.—A vast cooling system is being built into Tidewater Oil Co.'s 130,000-bbl. refinery here.

Photograph above shows seven of the nine 2,000-hp. pumps which will send 275,000 gal. of water per minute surging through the 15-mile cooling system. Water will be drawn from the Delaware River, circulated, and returned to the river without coming in contact with the oil.

The system is capable of handling 396,000,000 gal. of water daily. Peak usage for a city the size of Tulsa is 80,000,000 gal. daily.

Crude shipments are now being received at the plant and some personnel is moving into the administration building. The crude unit is scheduled to start up in late September. Initial operation of the fluid catalytic cracker, fluid coker, and other processing units will follow. The entire refinery is scheduled for full stream late this year.

Federal Lands Probe Launched

WASHINGTON.—An intensive study of the use of federal lands by the Government and the public is getting under way in the Interior Department.

The work will cover demands for and the use of both onshore public lands and the Government's domain in the outer Continental Shelf by military, other federal agencies, and commercial interests.

The plan to make the first real study of the subject was disclosed by Sec. Fred A. Seaton in a letter to Rep. Clair Engle of California. Engle, chairman of the House interior committee, has been fighting what he terms military land "grabs" which are expropriating valuable oil lands.

A bill to require congressional approval of any military withdrawal of 5,000 acres or more was sponsored by Engle last session. It passed the House but did not reach the Senate before adjournment of Congress.

To push for bill . . . Engle announced he will push for passage of the bill at the next session. But in the meantime, he asked the Defense Department to hold up any planned withdrawals, including one of up to 35,000,000 acres off the Louisiana coast.

Engle also wrote Seaton at the end of the session that the military had not justified the withdrawal of all its existing holdings, much less new ones it seeks. And attempts by the Air Force and Navy to get Continental Shelf lands raised mineral-development questions which should be settled by Congress, he said.

The question of submerged-lands withdrawals has been of concern to Interior officials for some time. They have been seeking to make a big showing of the revenues which will come from development of the Continental Shelf oil and gas resources.

They opposed military withdrawals in the area because much of the land involved carries oil prospects. The department, however, could do no more than protest, since final decision on withdrawals did not lay in its hands.

The department's study is expected to reveal just how much of the federal holdings have been taken over by the military and the use that is being made of it. It also may cover the multiple-use possibilities on the federal lands.

Offshore Discovery?

Richfield may have major strike off Santa Barbara

SANTA BARBARA.—Richfield Oil Corp. is reported to have made a major discovery on a 3,840-acre lease offshore from Coal Oil Point, Santa Barbara County.

The 5,800-ft. "no dope" hole was drilled from Richfield's drilling barge as part of a joint core-hole project on State Leases 308 and 309 with Signal Oil & Gas Co. and Honolulu Oil Corp. Richfield is said to have 600 ft. of Sespe formation open in the hole.

Early this year Richfield tried to find production on Lease 309 with a slant-drilled test from an onshore site on the Santa Barbara College campus. The deepest penetration was 6,600 ft. with total footage, including the original hole and redrills, running to 21,455 ft.

These leases were originally granted to Macco Oil Co. and Honolulu in 1945 for 20 years.

Pipe Mills Plans Differ

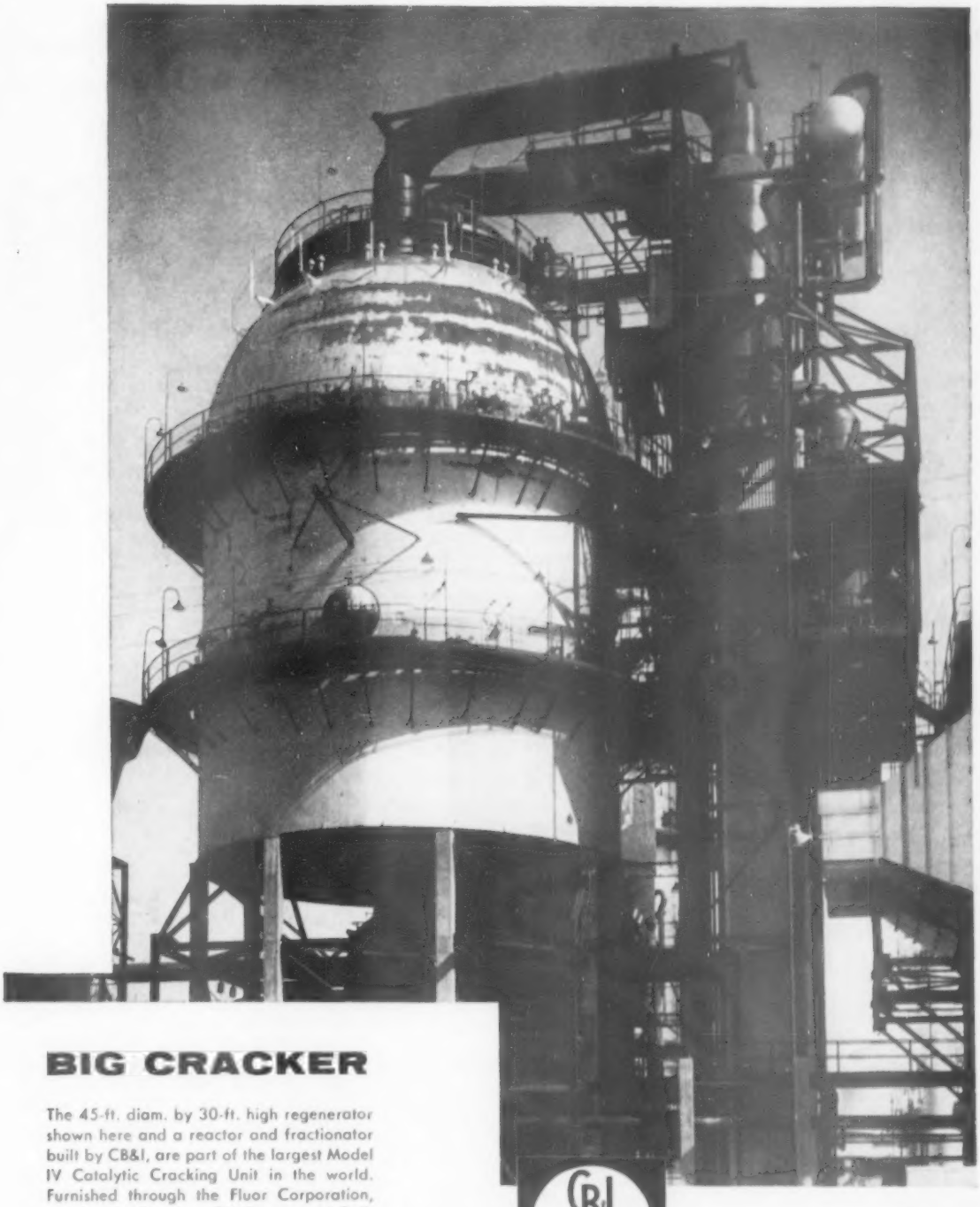
REGINA.—Plans for two local pipe mills have moved in opposite directions.

Construction will start next month on a $3,000,000 mill at Armour, 5 miles north of here, for production of resistance-welded steel pipe. It should be in operation by next April.

The plant, first project of newly formed Prairie Pipe Manufacturing Co., will have a capacity of 75,000 tons a year. It will cold form pipe ranging from 3½ in. in diameter to 16 in. Steel will come from eastern Canadian mills. Prairie Pipe is Canadian owned.

Meanwhile, the Saskatchewan Government has made an unconditional loan offer of $500,000 to Hoesch Werke, a German firm, to prevent delay in the building of another $3,000,000 mill.

The offer followed a company announcement of plans to postpone construction indefinitely because of steel shortages and rising prices. Before getting the government money, Hoesch Werke would have to spend half the estimated cost of the plant. Footings for the mill were poured last fall.



BIG CRACKER

The 45-ft. diam. by 30-ft. high regenerator shown here and a reactor and fractionator built by CB&I, are part of the largest Model IV Catalytic Cracking Unit in the world. Furnished through the Fluor Corporation, Ltd. for the Standard Oil Company of California's refinery at El Segundo, California, it has a design capacity of 40,000 B.P.D. The reactor was field stress relieved and X-rayed as was the lower 21 ft. 9 in. shell and bottom head of the fractionator which is clad with 12 per cent chrome.

When planning additions, or a new refinery, write Chicago Bridge & Iron Company for information on welded steel plate structures.

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New Gas Drive Cleared

Humble wins permission to inject rich casing-head gas into pay zones at Bronte and Seeligson fields in Texas

AUSTIN.—Humble Oil & Refining Co. has clearance from the Texas Railroad Commission to try its new "condensing-gas drive" method of secondary recovery in Bronte and Seeligson fields in Texas.

The technique calls for injecting rich casing-head gas or separator gas souped up with propane into the pay horizon *(The Oil and Gas Journal, July 16, page 70, and August 6, page 60)*. The heavy gas actually will be absorbed by the reservoir oil. And in effect the oil will be washed out of the reservoir.

High returns . . . Humble believes from its laboratory work that the condensing-gas drive will recover up to 50 per cent more oil from the Bronte pays than a water flood.

Generally, it feels that the method is capable of hiking recovery from 60 to 100 per cent of original oil in place in a field. At Seeligson, it thinks the new type drive will boost recovery from that field's 20-B pay to 475 per cent of that available by primary production.

The process will flush out oil in about the same manner as the high-pressure, gas-injection process pioneered so successfully in Block 31, Devonian field, in West Texas by Atlantic Refining Co.

The Atlantic process, however, involves injecting dry gas at very high pressure (about 4,000 psi.) and is regarded as feasible only in reservoirs with bottom-hole pressures of 3,000 psi. or above.

If the Bronte and Seeligson experiments prove out, it means that many of the shallower, lower-pressure reservoirs also may qualify for similar greatly increased recoveries.

At Bronte . . . In Bronte field, the Railroad Commission approved unitization of five different producing zones—the Palo Pinto, Capps, Goen, and Cambrian oil pays and the Gardner gas zone.

Rich casing-head gas from the four oil zones, supplemented with gas from the Gardner, will be injected in the vapor phase through five input wells into the Goen and two in the Cambrian.

The Palo Pinto at 4,400 ft. is believed too far gone for a condensing-gas drive but may be water flooded later. Development of the 4,600-ft. Capps as yet is not far enough along to determine whether the technique will work there.

Rich-gas injection will be started in that zone, too, if further development proves it feasible.

Recovery via the drive in the Goen and Cambrian pays is expected to be about 4,500,000 bbl. more than for a water flood and roughly 13,500,000 bbl. more than could be produced under primary methods.

Each of the Bronte pays has a productive area ranging between 1,000 and 3,000 acres.

Though approving unit and secondary-recovery plans at Bronte, the commission refused to grant immediately Humble's request for an allowable credit for injected liquid hydrocarbons.

Its decision on this will be held up until "the effectiveness of the condensing-gas drive is proved to the satisfaction of the commission."

At Seeligson . . . Humble will vary the injection plan at Seeligson somewhat, primarily because at Bronte the pays are undersaturated while Seeligson's zone 20-B is not.

The company will inject a half-and-half mixture of propane and separator gas into the pay at 6,200 ft. It plans to inject 35,000 to 40,000 bbl. of propane and about 50,000,000 to 55,000,000 cu. ft. of gas a month.

Primary recovery from the zone, Humble estimates, would run about 1,250,000 bbl., while the condensing-gas drive should hike this to 7,200,000 bbl.

Senate Renews Lobby Probe

WASHINGTON.—The Senate lobby investigating committee will pick up its probe of pressures for and against the Harris natural-gas bill next week.

Chairman John L. McClellan of Arkansas announced that a group of oil company officials will testify September 10 on their activities on behalf of the measure.

McClellan said a number of political science experts also will appear to make recommendations for tightening the lobbying laws.

The Senate investigation, an aftermath of the Case "incident" involving the offer of a $2,500 "campaign contribution," suspended early in the summer after taking testimony from members of several industry groups.

Industry BRIEFS

LOS ANGELES.—The Texas Co. began excavation last week for construction of a new 13-story office building in the Wilshire district of Los Angeles. The new Texaco Building will be headquarters for the company's activities in eight western states. The company currently occupies offices in downtown Los Angeles.

TULSA.—The price of sucker rods has been increased 6 per cent across the board on all types in all zones. The increase reflects higher material and labor costs growing out of new contracts negotiated with union steel workers. The composite steel price was raised $8.50 per ton to $138.50 following the 5-week steel strike. Pipe went up from $9.50 to $21.25 a ton *(The Oil and Gas Journal, August 13, page 86)*.

WINNIPEG. — Amerada Petroleum Corp. paid the biggest bonus at a lease sale held recently by the Manitoba government. Amerada paid $51,667 for rights on 92,000 acres about 12 miles southeast of Brandon. The sale netted the government $89,150.

REGINA.—Southwestern Saskatchewan's Fosterton Roseray sand formation might get a major water flood. Mobil Oil of Canada, Ltd., has filed for permission to test the area with a pilot flood.

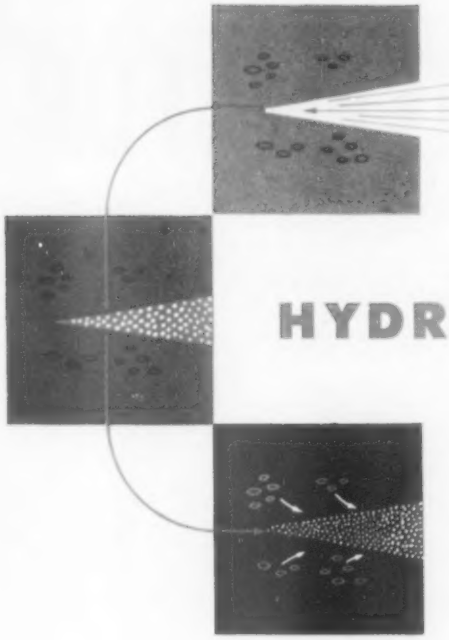
TULSA.—Exhibit space at the 1959 International Petroleum Exposition here is moving fast. Some 60 per cent of previous exhibitors have reserved over 90 per cent of outside locations.

General Manager William B. Way revealed inquiries coming in from firms not previously entered indicate there will be a lot of new faces on hand when the big show opens. The exposition, scheduled for May, will be a highlight of oil's 100th anniversary year.

BATON ROUGE. — A block of about 19,500 acres under White Lake in Vermilion Parish will be offered for lease by the Louisiana Mineral Board September 20.

The acreage, divided into 20 tracts, comprises most of the east half of the lake. It lies between West White Lake field and East White Lake field.

The mineral board announced that oil and gas leases will be offered at the same time on 26 additional tracts covering more than 31,000 acres. These tracts, mostly under inland waters, are scattered throughout several parishes.



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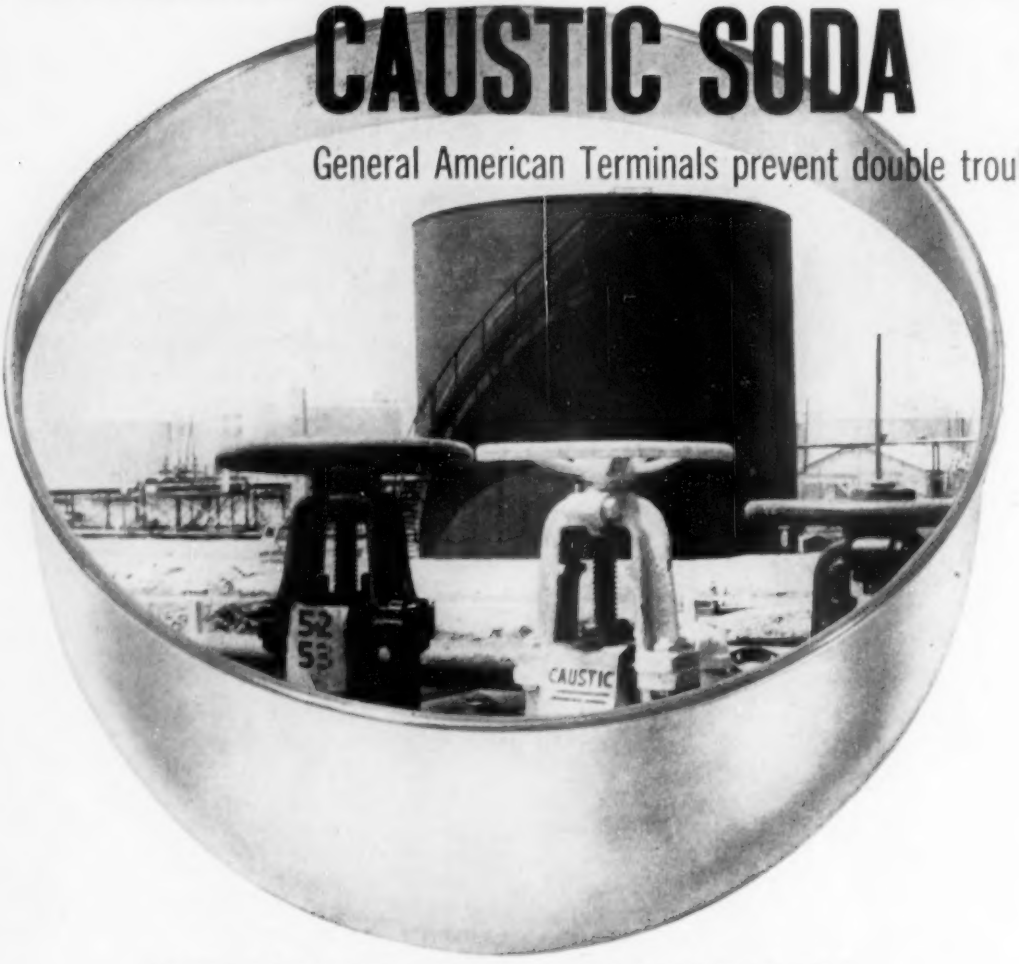

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Free-World Output Hits New Peak

FREE-WORLD crude production rose to a record high in June, despite a slump in Middle East output for the first time in 7 months.

The production pattern resembled June last year when Middle East output declined at the same time Western Hemisphere countries other than the United States reported gains.

Total output outside Soviet-controlled areas was 14,945,800 bbl. daily, a net gain of 93,700 bbl. daily over May. U. S. production rose 36,000 bbl. to 7,100,000 bbl. daily. Of the 7,845,800 bbl. daily produced in other areas, 3,502,600 bbl. daily came from the Western Hemisphere, and 3,704,000 bbl. daily from the Middle East.

Venezuelan flow up . . . Companies operating in Venezuela produced a record amount of crude, 2,446,200 bbl. daily.

This was a gain of 97,600 bbl. daily over the previous month and accounted for most of the 146,100-bbl. daily increase in the Western Hemisphere other than the U. S. The high level brought the Venezuelan half-year production average to 2,362,400 bbl. daily, a gain of 252,600 bbl. daily, or 12 per cent over the first 6 months of 1955.

Middle East down . . . All major Middle East producers except Iran shared in the decline of 89,900 bbl. daily.

Kuwait output fell off 53,900 bbl. daily to 1,153,100 bbl. daily. This brought the 6-month average to 1,170,400 bbl. daily, up 65,400 bbl. daily over last year.

Saudi Arabian production of 1,083,300 bbl. daily was off 38,000 bbl. daily from May, the kingdom's peak month. The 6-month average of 1,047,100 bbl. daily was 102,800 bbl. daily, or 10.3 per cent greater than in 1955.

Iraq production of 713,300 bbl. daily was down 2,000 bbl. daily.

Iranian production rose 11,000 bbl. daily to 571,000 bbl. daily. But this was 5,000 bbl. daily under April, the top month since the resumption of operations in 1954.

Some new records . . . Three western European countries set new production records, although the actual gain in barrels was comparatively slight.

West German output gained 1,400 bbl. daily to reach 69,200 bbl. daily, the fourth record in a row.

Output in Italy rose 200 bbl. daily to 10,800 bbl. daily, the third high in succession.

The Netherlands had a high of 21,000 bbl. daily, also its third in a row.

Companies in Colombia, which have a comparatively stable production, increased output by 6,400 bbl. daily to a record high of 124,400 bbl. daily. This was the greatest monthly gain in 2½ years.

Russia speaks up . . . Russia has given a firm crude production figure for the first half of 1956.

The Central Statistical Administration said that 39.7 million metric tons were produced, a gain of 19 per cent over the first half of last year. This amounts to 1,590,000 bbl. daily.

TREND OVER THE LAST YEAR

	Western Hemisphere less U.S.	Middle East	Total, non-Communist countries
1955—			
June	3,026.7	3,199.6	6,752.7
July	3,092.7	3,275.8	6,872.1
August	3,140.4	3,243.0	6,978.2
September	3,130.9	3,256.9	6,990.7
October	3,179.6	3,378.2	7,166.0
November	3,255.0	3,386.0	7,248.3
December	3,298.5	3,316.1	7,227.2
1956—			
January	3,363.7	3,392.6	7,368.5
February	3,426.2	3,415.7	7,453.4
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,356.5	3,793.9	7,788.1
June	3,502.6	3,704.0	7,845.8

World-Wide Crude Production

(Daily average in thousands of barrels)

Country—	June 1956	May 1956	June 1955
Western Hemisphere:			
Argentina	84.2	84.2	85.2
Bolivia	8.5	8.5	7.4
Brazil	7.0	7.0	5.2
Canada	423.0	387.3	361.0
Chile	9.8	9.3	6.5
Colombia	124.4	118.0	110.0
Cuba	1.3	1.6	1.3
Ecuador	9.8	9.8	9.3
Mexico	260.0	255.0	255.1
Peru	49.9	49.7	46.8
Trinidad	78.5	77.5	66.4
Venezuela	2,446.2	2,348.6	2,072.5
Total	3,502.6	3,356.5	3,026.7
W. Europe & Africa:			
Algeria	0.7	0.7	1.0
French Morocco	2.2	2.2	2.1
Egypt	38.6	39.3	33.0
Austria*	64.7	64.7	
France	23.8	23.5	16.8
West Germany	69.2	67.8	61.3
Italy	10.8	10.6	3.8
Netherlands	21.0	20.6	19.5
Turkey	5.5	5.5	3.7
United Kingdom	1.2	1.2	1.0
Yugoslavia	5.3	5.5	4.9
Total	243.0	241.6	147.1
Middle East:			
Bahrain	30.0	30.0	30.0
Iran†	571.0	560.0	364.0
Iraq‡	713.3	715.3	701.1
Israel	0.6	0.6	
Kuwait	1,153.1	1,207.0	1,079.2
Neutral Zone	30.0	30.0	24.6
Qatar	122.7	129.7	115.4
Saudi Arabia	1,083.3	1,121.3	885.3
Total	3,704.0	3,793.9	3,199.6
Other Asia:			
British Borneo	115.0	115.0	111.3
Burma	5.2	5.2	4.0
India	7.5	7.5	7.5
Indonesia	250.0	250.0	236.0
Japan	6.3	6.0	6.0
New Guinea	6.7	6.7	9.1
Pakistan	5.7	5.7	5.4
Total	396.2	396.1	379.3
Total Free World Foreign	7,845.8	7,788.1	6,752.7
United States	7,100.0	7,064.0	6,613.0
Total Free World	14,945.8	14,852.1	13,365.7
Communist Countries in Soviet Orbit:			
Russian Zone of Austria*			68.2
Romania	150.0	150.0	125.0
Russia	1,600.0	1,600.0	1,260.0
Others	50.0	50.0	36.8
Total	1,800.0	1,800.0	1,490.0
World total	16,745.8	16,652.1	14,855.7

*Austria took over its producing fields from Russia in August 1955.

†Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

‡Includes estimated 3,800 bbl. daily this year and 12,000 bbl. daily in 1955 from Naft Khaneh field, operated by British Petroleum Co., Ltd., rather than I.P.C.

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where complete current reports are lacking. Communist countries in the Soviet orbit includes satellite countries in Europe and Red China.

Remote Strike in Iran May Open Vast Area

● Wild well stirs speculation that this may be the best strike yet in already-fabulous Iran. It's the first hit outside the consortium concession on the Persian Gulf

A RANK wildcat in north-central Iran, more than 200 miles from the nearest Iranian production, was running wild last week throwing an estimated 80,000 bbl. of oil daily 150 ft. into the air.

The discovery was made by National Iranian Oil Co., the government firm, and promises to rival or better anything yet found in Iran's fabulous oil history. It is the first major oil discovery outside the wide concession on Iran's western and southern border.

Fields in this strip are operated by the international consortium of oil companies. They produced 593,000 bbl. daily in July.

Estimates of the well's flow ranged from the 80,000-bbl. figure reported by the Iranian Government to 150,000 bbl. daily cited by other observers. Geologists in the United States who are familiar with the Miocene salt basin where the well was drilled say the 150,000-bbl. figure may be too high, but 80,000 bbl. is a reasonable esitmate.

The best well at Agha Jari, the major field in the consortium's producing area, can produce about 50,000 bbl. daily.

One report from the rig said the well blew wild when the bit broke out of shale and entered porous limestone at 7,800 ft.

The mud, weighing 130 lb. per cubic foot (17.4 lb. per gallon), was unloaded in 3 minutes. The ram rubbers in the control head of the blowout preventer were cut out and the well started flowing wild at 150,000 bbl. per day. Gas flow was estimated at 200,000,000 cu. ft. per day.

Bottom-hole pressure was reported at 11,000 psi. and surface pressure 10,000 psi. Some 6,000 ft. of 9⅝-in. casing had been set and all the couplings remained intact. The drill pipe was still in the hole last week.

Iran calls for help . . . Iran appealed to engineers of the world's major oil companies employed by the consortium to help cap the well.

Myron Kinley, Houston, internationally known oil-well fire fighter, flew to Iran last week.

Reports from Teheran indicated that every precaution was being taken to prevent a fire. Troops and police were patrolling the highway linking Teheran with the Persian Gulf to enforce precautionary measures. All personnel in the area of crude-soaked fields were being required to wear rope-soled shoes. Rail and highway traffic was halted.

Consortium engineers estimated it may take at least 2 weeks to control the well.

Location . . . The well was drilled by Drilling & Exploration Co., Los Angeles, under contract to N.I.O.C.

It was spudded last November near Qum, about 90 miles south and slightly east of Teheran. Qum is on the railroad linking the refining center at Abadan and the principal highway from the Iranian capital to Persian Gulf ports.

The well site is more than 100 miles north and east of the consortium boundary and at least 200 miles northeast of Lali, the consortium's nearest oil field. It is almost 300 miles east of Naft-i-Shah, the only producing field in Iran outside the consortium area. Naft-i-Shah, on the Iran-Iraq border, is operated by N.I.O.C. and produces about 4,000 bbl. daily.

The wildcat strike is about 325 miles to the east and just a little south of Iraq's prolific fields at Kirkuk. Some 350 miles to the north, across the Caspian Sea, lie the great Russian fields at Baku.

Structure . . . The test was drilled on

the Qum anticline in an area where the old Anglo-Iranian Oil Co. (now British Petroleum) did some drilling years ago before the concession area was limited to the Persian Gulf coastal area.

Since 1950 the Iranian government company has drilled four wells in the region. Oil shows were encountered in some of the tests, but all were abandoned because of mechanical difficulties.

The fifth test—the one which is now flowing wild—was the first to reach the top of the Asmari limestone which straddles the Iraq-Iranian border and is productive in both countries.

The Qum anticline is a well-defined east-west structure at least 20 miles long. It lies in a Miocene salt basin separated from Iran's productive fields by the Zagros range of mountains which divides the country's Persian Gulf coastal area from the interior. The interior basin is bounded on the west by Bahst-i-Kavir Desert and on the north by the Alburz Mountains along the Caspian Sea.

Drilling problems . . . Salt layers appear on the surface in some areas on the western end of the Qum anticline. Drilling in this salt has caused the Iranian company's mechanical failures. The previous wells all had trouble with flowing salt strata and crushed casing.

The first was abandoned as dry at about 7,000 ft. after Iran Oil Co. was organized by the government in 1949 to take over all oil operations outside the consortium area. National Iranian Oil Co. took over from Iran Oil after the nationalization.

The second test was taken to 2,500 ft. on the flank of the anticline to obtain stratigraphic data. The third was carried to almost 7,500 ft. and tested nearly 200 bbl. of crude daily in mid-1952, but ran into mechanical troubles. The fourth reportedly had shows also, but was never as productive as the new discovery. All the wells were drilled by Drilexco.

Panama Terminal Planned

Panama Refining, Inc., will start work soon on a deep-water terminal at the site of its proposed 70,000-bbl. refinery near the Panama Canal's Atlantic entrance. The terminal will handle tankers up to 94,000 tons.

Detailed plans for the refinery and its process units will not be disclosed until the first quarter of next year, according to D. K. Ludwig, New York shipping operator who heads the new company. The company has purchased a 2,000-acre undeveloped site on Las Minas Bay, 6 miles from the canal entrance.

Cuban Farmouts Pick Up

Stanolind to drill on one-third of the concessions held by White Eagle International; other deals are pending

STANOLIND OIL & GAS CO., now exploring a 12,000,000-acre concession in Cuba, has added 1,118,000 acres to its program which was already the biggest in the island's history.

Its agreement with White Eagle International Oil Co., like Stanolind a Tulsa firm, is one of several farmouts made in Cuba recently. The farmouts have been spurred in part by the 1 Catalina discovery by Cuban American Drilling & Exploration Co. And other deals are in the wind which will bring still more majors and independents into the Cuban picture.

The prospect of increased activity also has led drilling contractors to consider moving more rigs there. There were only a dozen rotaries running in the spring but that number could increase when drilling commitments made recently are carried out.

Stanolind-White Eagle . . . The new acreage acquired by Cuban Stanolind Oil Co. is held by Calcuba Oil Co., Inc., and San Lazaro Oil Co., Inc., affiliates of White Eagle.

It adjoins concessions in Camaguey and Oriente provinces already being explored by Stanolind under agreement with Cuban-Venezuelan Oil Voting Trust and Trans-Cuba Oil Co. In some instances Stanolind controls acreage on three sides of White Eagle.

The deal permits Stanolind to consolidate the blocks and greatly increase its prospective exploration territory for a relatively small added cost. The two programs can be coordinated. Drilling on either concession will contribute valuable geological data.

Under terms of the deal, Stanolind will:

. . . Conduct preliminary exploration for up to a year before deciding on its first location.

. . . Drill at least two wells to 7,500 ft. or basement, whichever is lesser, or pay a penalty for failure to do so.

. . . Earn half interest to a depth of 200 ft. below the well in the structure on which the test is drilled.

After each test Stanolind will have an option to start another within 90 days in a different area. The company will bear the entire cost of drilling, completing, and equipping each well. It may drill the two required wells on its own acreage if the locations are on geological structures which extend onto White Eagle holdings.

Other deals . . . Mountain Valley Oil Corp., Denver, has formed a Cuban subsidiary, Petrolera Mountain Vallera de Cuba, S.A., capitalized at $2,000,000.

Jerry O'Dell, Mountain Valley president, said the company will explore two concessions acquired from Trans-Cuba.

O'Dell said the first test will be started this fall in the vicinity of the Cuban American discovery, which came in last month for 30 bbl. daily from perforations in a limestone section at 7,107-20 ft. Earlier tests indicated much higher potential.

This strike is located 4½ miles southwest of Jatibonico field, whose discovery in May 1954 led to the current play and which now accounts for most of Cuba's 1,300-bbl. daily production.

Union Oil Co. plans to drill two wildcats on 934,000 acres farmed out from Reiter-Foster Oil Corp., New York. Union will conduct all preliminary exploration and drilling in return for half interest in the concession.

Standard Oil Co. (N. J.), active in Cuba for several years, renewed its position last spring by acquiring 75 per cent interest in 926,525 acres held by Cuban-Canadian Petroleum Co.

More to come . . . Petro-Atlas Corp., a new company which consolidated the oil holdings of Atlas Corp., is expected to complete a deal soon with Southern California Petroleum Corp., which controls 150,000 acres beneath the Bay of Batabano offshore from Havana Province.

Each would have half interest in the acreage, sandwiched between concessions of Siboney Caribbean Petroleum Co. and Stanolind.

Cuban-Canadian, which is drilling a test in the vicinity of the 1 Catalina, has other deals pending to farm out parts of its scattered acreage.

White Eagle still has more than 3,000,000 acres available for farmouts similar to the one made with Stanolind. The company, headed by Walter H. Helmerich, Tulsa, last May took over 4,330,000 acres from Petrolera Perla Negra de Cuba and five other companies which became subsidiaries of White Eagle *(The Oil and Gas Journal, May 7, page 103)*.

Egypt Seeks Suez Pilots

Oil traffic slows slightly; U. S. committee plans moves to take if canal is closed but no emergency is imminent

EGYPT began trying to recruit Suez Canal pilots in the United States last week as oil traffic through the vital artery began to slow down.

Similar efforts to hire ship masters to guide vessels through the canal were being made in Germany and Scandinavian shipping countries. Only two Americans are now among the more than 200 pilots employed at the canal.

The ironic fact is that Britain and France, which have the most to lose if canal traffic were hampered, could close the 103-mile waterway more effectively than could Egypt. More than 100 of the canal's pilots are British or French. They have already registered with their respective embassies in Egypt for a return home.

If the foreign pilots left Egypt, the canal would be crippled.

Only 38 pilots are Egyptian nationals and only a few of these are qualified to handle ships of more than 15,000 tons.

Col. Gamal Abdel Nasser last week agreed to meet with a committee of western powers to discuss the Suez issue.

The Egyptian president made no commitments whatever, but the fact he agreed to the meeting encouraged the west. The more than 1,500,000 bbl. daily of oil which moves through the canal is vital to Western Europe.

Despite the drop in traffic, reports to Washington indicated no immediate crisis is threatened.

Emergency plans disclosed . . . Just what effect the loss of experienced pilots is having upon canal transits is one of the points under study by the Middle East emergency committee.

Following a meeting of the committee in New York August 24, a course of studies was set out. Data on various aspects of the Middle East oil situation should start flowing into Washington in a short time.

The study of these problems and recommendations to deal with them are the only functions of the committee at this time. It will take an order by Interior Secretary Fred A. Seaton to set the plan of action adopted last month into operation.

The complete text of the plan of action under the voluntary agreement on foreign petroleum supply was made public by the Office of Defense Mobilization last week. In essence, it parallels the plan adopted in 1950 to deal with the crisis raised by the cutting off of Iran's oil.

The voluntary agreement, of which the plan of action is an offshoot, provides that the foreign petroleum supply committee shall have a government chairman, now Hugh A. Stewart, director of Interior's office of oil and gas, and prohibits the interchange of operational information between members.

Both of these requirements are dropped in the case of the emergency committee. The chairman will be an industry man who will be able to act faster and more efficiently than a government official less familiar with the Middle East oil situation. And since joint action by companies will be required to meet an emergency, the exchange of information is essential.

The prime goal of the plan of action is "to help formulate and carry out measures to meet petroleum shortages and dislocations in the event of any substantial Middle East petroleum transport stoppage," the document declares.

As previously announced by the ODM, the immediate functions of the committee will be to make surveys and set up information on foreign oil operations, estimate oil requirements of foreign areas, and make recommendations as to the stocks that should be maintained, particularly by the western European countries and the United Kingdom.

Plan of action . . . In the event an emergency calls for action to assure a continuous supply of oil to the countries dependent on Middle East sources, the plan defines the areas in which member companies shall act.

To assure maximum transportation and distribution of crude and refined products, they may arrange among themselves and with other operators designated by the interior secretary for:

. . . **The most efficient use** of terminal and storage facilities, without regard to ownership.

. . . **The purchase, loan, sale,** or exchange of crude, products, and blending agents.

. . . **Altering the rate of crude** production and output of refined products in foreign areas.

The committee may solicit funds among its participants to pay expenses of the operation.

Monopoly safeguard . . . While the committee is given latitude not now granted to other industry advisory bodies, its deliberations and activities will be subject to constant review by the attorney general to make sure that the antitrust laws are not violated.

The effect of a cutting off of Middle East oil would be world wide. The plan of action lists the principal foreign areas which would be directly affected. They would include all of Western Europe, the Middle East, all of Africa, most of the Far East, Latin America, the West Indies, Canada, Australia, and New Zealand.

Karachi Gets Play

West Pakistan exploration shifts to capital city itself

EXPLORATION play in West Pakistan has shifted to the capital itself, where a test is now drilling.

The well was spudded late in August on Drigh Road, near the main street running from the capitol building to the Karachi airport.

Pakistan Petroleum, Ltd., is drilling the well, located about 3 miles from the center of the city on a 12-acre site leased by the government. The rig being used is the one which made the discoveries of Sui and Uch gas fields.

Another British firm, Attock Oil Co., will start its second well soon at Adhi in Jhelum district, in collaboration with P.P.L. A test also is planned by P.P.L. near Khairpur.

Standard-Vacuum Oil Co. is now drilling below 8,000 ft. at Digh in Hyderbad. The projected depth of the test is 10,000 ft. Hunt International Oil Co.'s test of Dahk anticline near the Makran coast is below 5,000 ft.

Italy Plans Acreage Grants

The Italian Government will begin considering applications for concessions September 4. The Superior Mines Council will handle requests on about 22,000,000 acres.

Private oil companies, Italian or foreign, are not expected to show great interest in the exploration licenses since they will be issued under the terms of Italy's new "tough" oil bill, which was passed by the Chamber of Deputies recently *(The Oil and Gas Journal, July 16, page 82)*. The bill is expected to become law with passage by the Italian Senate some time this fall.

The law provides for the government to get 82.6 per cent of profits from a major oil discovery and sharply limits the exploration and development acreage allowed a private company.

India Compromises

Government settles for minority interest in company to produce rich field, takes control of refining affiliate

INDIA'S movement toward nationalization of oil has been slowed, at least temporarily.

The government has accepted a broad compromise agreement with Assam Oil Co. on the role each will play in a new industry about to spring up around Upper Assam's growing Nahorkatiya field, where reserve estimates have doubled in a few months.

Assam, a subsidiary of Burmah Oil Co., Ltd., won two-thirds interest in a proposed company to produce the rich field. The government settled for a one-third interest, but will have a "substantial majority" in an affiliated refining company.

The projects are expected to cost from $110 million to $140 million. Lack of these facilities has delayed full-scale development of Nahorkatiya.

The dispute over capital structure of the operating companies had been under negotiation for several months. The argument hinged on India's demand for control through 51 per cent interest in Assam's oil operations *(The Oil and Gas Journal, May 7, page 102)*.

Only two major barriers to complete settlement of the issue remain. These are:

. . . Location of the refinery. The government prefers a site near the producing field. From there, the plant could supply Assam, North Bengal, and other areas of northeastern India. Assam Oil wants the location in Calcutta for economic reasons, although a pipeline to that city would extend 850 miles.

. . . Transportation of crude. Assam is believed to prefer the formation of a third company for this purpose. The government wants the producing company to have the responsibility.

While the argument continues, Nahorkatiya grows. Assam now estimates the field can supply a minimum of 2,000,000 tons of crude a year for at least 20 years. This would amount to around 40,000 bbl. daily and set proved reserves at more than 300,000,000 bbl. Last July, the announced estimate was 1,000,000 tons *(The Oil and Gas Journal, July 23, page 74)*.

Seventeen wells have been completed in the area, either at Nahorkatiya or as wildcats on Moran and Hugrijan licenses. All but three have been producers. Two more wells are near completion. Three new locations have been staked.

New India commission . . . In another development, India has established the Oil and Natural Gas Commission, headed by K. D. Malayiya, minister of natural resources.

The three-man body will advise the government on petroleum matters and will have authority to administer and carry out agreements with oil companies.

The commission will also undertake, either by itself or with other government agencies, exploration, production, and refining projects. The group replaces the former Oil and Natural Gas Directorate.

Tapline Pact Nears

Countries reportedly in agreement on profit split

JORDAN, Lebanon, and Syria began talks in Damascus last week to form a united stand on the offer of Trans-Arabian Pipeline Co. to split profits on a 50-50 basis with the three countries and Saudi Arabia.

The four countries are believed to have agreed in principle to Tapline's proposal. The company made the offer in May, and at that time volunteered to convert to a commercial, profit-making firm. If the offer is accepted, the countries would receive about $16,000,000 a year *(The Oil and Gas Journal, May 14, page 16)*.

Saudi Arabia was not represented at the meeting. But a Saudi spokesman said his government had given advance approval on any agreement reached, and denied earlier reports that the Saudis wanted half of the 50 per cent share.

There were indications that the other three countries preferred an equal four-way split.

I.P.C. fight . . . Meanwhile, the Lebanese Government and Iraq Petroleum Co., Ltd., remained at loggerheads over royalty payments.

Reports circulating in Lebanon were that the government was preparing legal measures to seize I.P.C. property if the company did not comply with the new law making it liable for income taxes retroactive from the beginning of 1952. I.P.C. has until September 15 to report its earnings from January 1, 1952.

International BRIEFS

The British Government last week gave its formal approval for the sale of Trinidad Oil Co., Ltd., to The Texas Co. for $176 million. The proposed sale raised a storm of protest in Parliament when it was first announced *(The Oil and Gas Journal, June 18, page 149, and June 25, page 83)*.

Pemex has opened a 150-mile L.P.G. pipeline connecting Poza Rica, near the Gulf of Mexico, with Mexico City. The line has a capacity of 4,300 bbl. daily of propane and butane.

A joint French-Swiss company plans to carry on an exploration program in the Perigord region of Central France. The French firm, Ste. des Petroles du Centre-Ouest, will have a 51 per cent interest. The Swiss firm, Molassee Erdoelfoerderung A.G. (Mofag), will hold the remainder. A permit over nearly 500,000 acres has been applied for.

Cie. Petroleo de Venezuela, backed by German capital, has been formed in Caracas and has applied for concessions totaling 150,000 acres in Barinas and Monagas. Initial capitalization of the new firm was $300,000.

The French Government has allocated another $5,800,000 for petroleum research, according to the Journal Officiel. The government's 1956 budget already included appropriation of $48,430,000 for this purpose.

Australia's first offshore exploration license last week went to Woodside (Lakes Entrance) Oil Co. for the coastal area in South Gippsland, Southeast Victoria. The company has three prospecting licenses for land areas in South Gippsland.

The Israeli Government will build a 6-in. products pipeline between the refinery at Haifa and Tel Aviv, the country's largest city. I. Kosloff, Israel's oil commissioner, said last week orders for pipe and pumping equipment totaling more than $1 million have already been placed in Germany. He said the line is expected to be in operation before the end of 1957.

A new 32,000-ton tanker has been delivered in Nagaski to Tokyo Tanker Co., Ltd., affiliate of the Caltex Group, after passing sea trials. The tanker Nikko Maru, with a geared turbine drive and service speed of 16 knots, will haul crude from Sumatra and the Persian Gulf to refineries at Iwakuni, Yokohama, and Kudamatsu.

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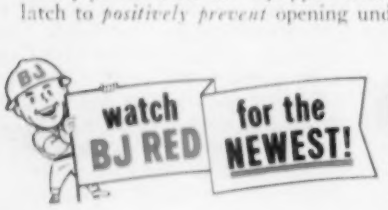

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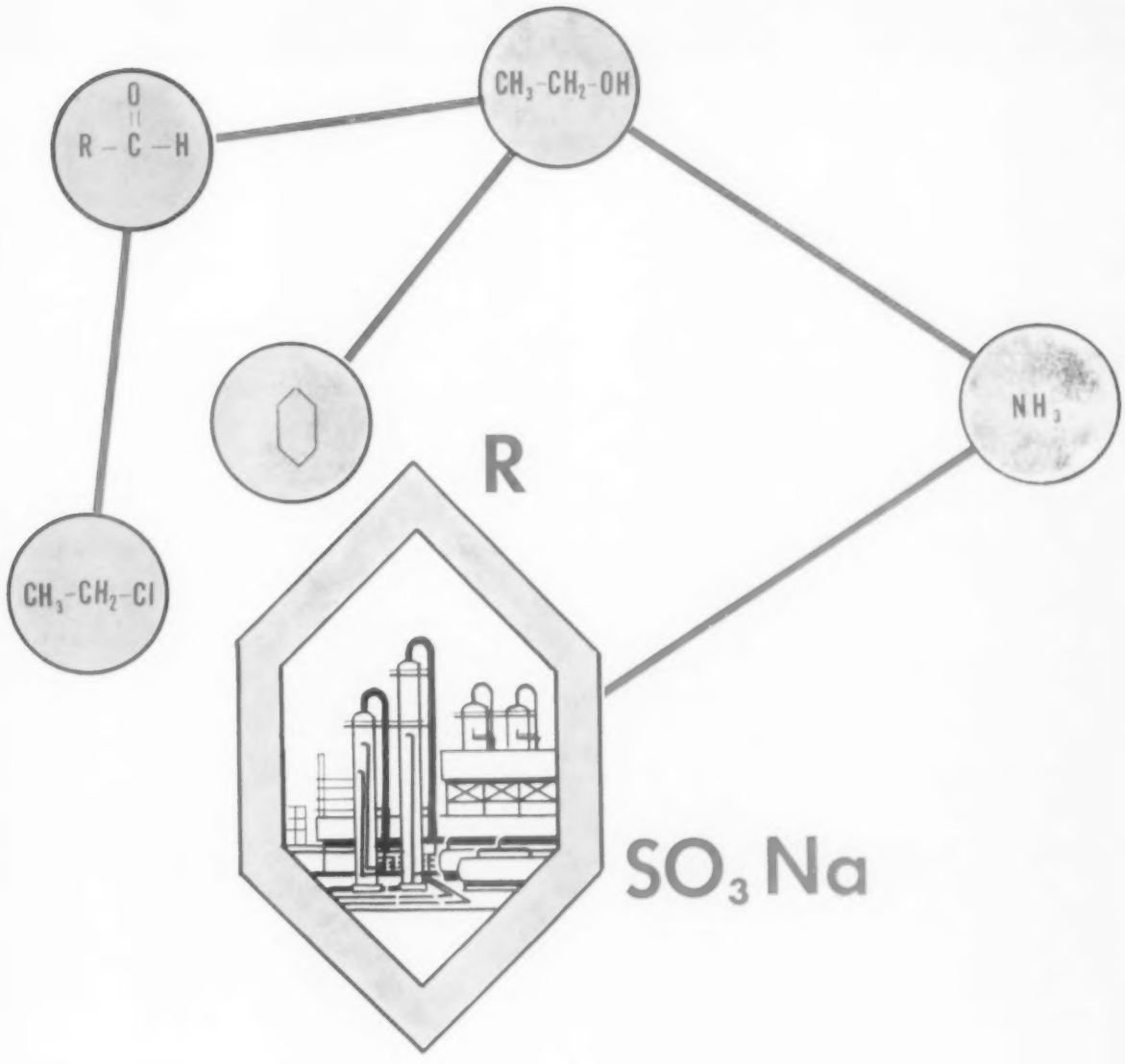


THE JOURNAL'S 1956 . . .

SURVEY OF PETROCHEMICAL PLANTS

. . . WHERE THEY ARE AND THEIR PRODUCTS

TABLE 1—U. S. ORGANICS

A

ALLIED CHEMICAL & DYE CORP., Barrett Div., Frankford, Pa.
Raw material: Propane-propylene blend.
Principal products: Phenol and acetone.
Personnel: T. J. Kinsella, president; T. Lee, works manager.

ALLIED CHEMICAL & DYE CORP., National Aniline Div., Buffalo, N. Y.
Raw materials: Kerosine fraction; white-oil fraction.
Principal products: Alkyl aryl sulfonates (water soluble); long-chain alkyl aryl sulfonates (oil soluble); dodecylbenzene.
Personnel: D. G. Rogers, president; J. F. Daly, plant manager.

ALLIED CHEMICAL & DYE CORP., Nitrogen Div. (see listing under Nitrogen Chemicals, Table 2).
Raw material: Ethylene.
Principal products: Ethylene glycol; ethylene oxide; and ethanolamines.
Personnel: Hugo Riemer, president; E. L. Ray, plant manager.

ALLIED CHEMICAL & DYE CORP., Solvay Process Div., Moundsville, W. Va.
Raw material: Methane (natural gas).

Principal products: Methyl chloride; methylene chloride; chloroform; carbon tetrachloride.
Raw material: Hydrogen (derived from methane).
Principal product: Hydrogen chloride.
Personnel: Carlton Bates, president; W. E. Dugan, plant manager.

ALLIED DYE & CHEMICAL CORP., Semet-Solvay Div., Buffalo, N. Y.
Raw material: Ethylene (from residual-oil fraction).
Principal product: High-melting-point polyethylene wax.
Personnel: A. E. Scherm, president; W. J. Wixson, superintendent.

ALOX CORP., Niagara Falls, N. Y.
Raw materials: Petroleum fractions.
Principal products: Oxygenated petroleum chemicals (for rust preventives; lube-oil additives; mixtures of organic acids and other oxygenated hydrocarbons.
Personnel: Edward M. Kaye, president; Eric F. Tiegerman, production supervisor.

AMERICAN CYANAMID CO., Avondale, La. (Fortier plant).
Raw material: Natural gas.
Principal products: Ammonia, hydrocyanic acid, acrylonitrile, ammonium sulfate (acetylene made at Avondale is used internally), monomethyl styrene plant in operation 1956.
1956-57 Activities: Doubling capacity for hydrocyanic acid, acetylene, acrylonitrile. Completion mid-1958. (1956-57-58 expansions total over $30,000,000).

AMERICAN CYANAMID CO., Warners, N. J.
Raw materials: Petroleum fractions.
Principal product: Oil-layer-type petroleum sulfonate (barium salt).
Personnel: Fred W. Zipt, Jr., works manager.

AMERICAN SYNTHETIC RUBBER CORP., Louisville, Ky.
Raw materials: Petroleum-derived stocks.
Principal products: Copolymer (GR-S), 44,000 long tons annual capacity.
1956-57 Activities: Expanding capacity to 68,500 long tons. Completion scheduled for first quarter 1957. Added capital investment totals $3,000,000.

ATLANTIC REFINING CO., Philadelphia.
Raw materials: Crude petroleum fractions, refinery gases, and solvent extracts.
Principal products: Aromatic solvents, crude carbolates, crude cresylic acid, propane, butylenes, diisobutylene, technical eicosane, nonene, triisobutylene, crude mercaptans, alkybenzene, nonyl dodecylbenzene, dodecylbenzenesulfonic acid type of water-soluble alkyl aryl sulfonates, sulfonated petroleum aromatic compounds including oil-layer-type petroleum sulfonates (barium salt and sodium salt).
Raw material: Asphalt.
Principal product: Thermoplastic resin.
Raw material: Detergent alkylate.
Principal products: Sulfonated detergents.
Personnel: W. O. Hoffman, superintendent, chemical manufacturing.

ATLANTIC REFINING CO., Atreco, Tex.
Raw material: Detergent alkylate.
Principal products: Sulfonated detergents.

ATLAS PROCESSING CO., Shreveport, La.
Raw material: Naphtha (400° F., e.p.) from natural-gas extraction.
Principal product: Benzene.
Personnel: V. B. Chance, president; W. L. Hiller, chief engineer.

B

BARIUM REDUCTION CORP., South Charleston, W. Va.
Raw material: Natural gas.
Principal products: Carbon disulfide, hydrogen sulfide.
Personnel: Thomas B. Jackson, president; Charles F. Hobson, plant superintendent.

BREA CHEMICALS (see Table 2).

BRIN CHEMICALS, Tulsa.
Raw material: Refinery-waste caustic-treating solution.
Principal products: Acid oils (phenols, cresols, xylenols).
Personnel: Benson P. Brown, president; Ruben Bullock, foreman.

C

CALIFORNIA-SPRAY CHEMICAL CORP., Richmond, Calif. (Subsid. Standard Oil Co. of California). (See also, Table 2.)
Raw materials: Petroleum bases.
Principal products: Summer and winter oil sprays; aromatic solvents, spray detergents and emulsifiers.
Personnel: J. H. Cole, superintendent of chemical division.

CARBIDE & CARBON CHEMICALS CO. (Div. of Union Carbide & Carbon Corp.), South Charleston, W. Va.
Raw materials: Natural gas, refinery gases, crude oil, other petroleum fractions.
Principal products: Acetaldehyde, acetaldol, acetic acid, acetic anhydride, acetoacetanilide, acetoacet-o-chloranilide, acetoacet-o-toluidide, acetonitrile, acetophenone, n-acetyl ethanolamine, amines, butadiene, butoxy ethoxy propanol, n-butyl acetate, n-butyl alcohol, n-butyl amine, n-butyl ether, butyraldehyde, butyric acid, butyric anhydride, crotonaldehyde, diacetone alcohol, dibutyl amine, dichloroethyl ether, dichlorisopropyl ether, diethanolamine, diethyl amine, diethyl ethanolamine, diethyl ketone, diethyl maleate, 2,2-diethyl-1,3-propanediol, diethyl succinate, diethyl sulfate, diethylene glycol, diethylene glycol monobutyl ether, diethylene glycol monoethyl ether acetate, diethylene glycol monoethyl ether, diethylene glycol dibutyl ether, diethylene glycol diethyl ether, diethylene glycol monomethyl ether, di-2-ethylhexyl adipate, di (2-ethylhexyl) amine, di (2-ethylhexyl) maleate, diisobutyl carbinol, diisopropanolamine, dioxane, dipropylene glycol, ethanol, ethoxytriglycol, ethyl acetate, ethyl acetoacetate ethyl acrylate, ethyl amine, ethyl butyl ketone, ethyl ether, ethyl formate, ethyl silicate, 2-ethyl 2-butyl-1,3-propanediol, 2-ethylbutyric acid, ethylene carbonate, ethylene chlorhydrin, ethylene dichloride, ethylene glycol, ethylene glycol monobutyl ether, ethylene glycol monoethyl ether, ethylene glycol monoethyl ether acetate, ethylene glycol dibutyl ether, ethylene glycol monomethyl ether, ethylene glycol monomethyl ether acetate, 2-ethyl-1,3-hexanediol, 2-ethylhexanol, 2-ethylhexoic acid, 2-ethylhexyl acetate, 2-ethylhexyl amine, 2-ethylhexyl chloride, glycol diacetate, glyoxal, heptadecanol, n-hexyl ether, hexylene glycol, hydroxyethyl cellulose, isobutanol, isopropanol, isopropanolamine, isopropyl acetate, isopropyl amine, isopropyl ether, 2-mercaptoethanol, methanol, methoxy polyethylene glycols, methoxy triglycol acetate, methyl acetone, methyl amyl acetate, methyl amyl alcohol, n-methyl diethanolamine, methyl isobutyl ketone, monoethanolamine, nonisopropanolamine, morpholine, 2,4-pentadione-phenyl diethanolamine, phenyl ethanolamine, phenyl ethyl ethanolamine, plasticizers such as dioctyl phthalate and other plasticizer components, polyethylene plastic, polyethylene glycols, polypropylene glycols, propionic anhydride, propylene chlorhydrin, propylene diamine, propylene dichloride, propylene glycol, propylene oxide, pyruvic aldehyde, surface-active agents (ionics and anionics), tetradecanol, thiodiglycol, trichlorethane, triethanolamine, triethyl amine, triethylene glycol, triglycol dichloride, triisopropanolamine, trimethyl nonanol, synthetic lubricants, undecanol, vinyl isobutyl ether.
Personnel: F. H. Belden, general superintendent.

CARBIDE & CARBON CHEMICALS CO., Institute, W. Va.
Raw materials: Natural gas, other petroleum streams.
Principal products: Acetaldehyde, acetic acid, acetic anhydride, acetone, acetonitrile, acetophenone, acrolein, acrylonitrile, n-butyl alcohol, butyric acid, butyric anhydride, diethylene glycol, diisobutyl ketone, 2-ethylbutanol, ethylene glycol, ethylene oxide, 2-ethylhexanol, n-hexanol, isophorone, isopropanol, aleic anhydride, mesityl oxide, methyl acetone, 2-methyl-5-ethyl pyridine, methyl isobutyl ketone, paraldehyde, plasticizers, α-picoline, γ-picoline, polyethylene glycols, propionic anhydride, trimethyl nonanone-4.
Personnel: C. H. Atwood, superintendent.

CARBIDE & CARBON CHEMICALS CO., Texas City, Tex.
Raw materials: Natural gas, refinery gases (ethane, propane).

Principal products: Acetaldehyde, acetic acid, acetic anhydride, acetone, 2-aminoethyl ethanolamine, butadiene, n-butyl acetate, n-butyl alcohol, diethylene glycol, diethylene triamine, ethanol, ethyl acetate, ethylene diamine, ethylene dichloride, ethylene glycol, ethylene oxide, isobutanol, isopropanol, isopropyl acetate, methanol, methyl acetone, methyl isobutyl ketone, polyethylene, tetraethylene pentamine, trichlorethane, triethylene tetramine, vinyl acetate, vinyl chloride, other vinyl resins and vinyl plastic materials. (Acetylene made from natural gas and ethylene made from natural gas and/or refinery gases, ethane, propane at Texas City are used internally.)
Personnel: T. A. Wilker, superintendent.

CARBIDE & CARBON CHEMICALS CO., Whiting, Ind.
Raw materials: Refinery gases.
Principal products: Acetic anhydride, acetone, ethanol, ethylene oxide and ethylene glycol, isopropanol, methyl ethyl ketone, and methyl isobutyl ketone.
Personnel: W. J. Bagby, superintendent.

CARBIDE & CARBON CHEMICALS CO., Torrance, Calif.
Raw materials: Refinery cracked gases (ethylene).
Principal products: Polyethylene, ethylene oxide and ethylene glycol.
Personnel: C. N. Rucker, superintendent.

CARBIDE & CARBON CHEMICALS CO., Seadrift, Tex.
Raw material: Natural gas (ethane).
Principal products: Butadiene, polyethylene, ethylene oxide and ethylene glycol.
Personnel: C. M. Blair, superintendent.

CARBIDE & CARBON CHEMICALS CO., Niagara Falls, N. Y.
Raw materials: Acetylene principally.
Principal products: Vinyl esters, acetic acid, hydroxyethyl cellulose.

CARBIDE & CARBON CHEMICALS CO. (Bakelite Co., subsid.), Marietta, Ohio.
Raw materials: Petroleum-derived stocks.
Principal products: Styrene plastics, phenol.

CELANESE CORP. OF AMERICA, Bishop, Tex.
Raw materials: Natural gas, liquefied petroleum gases (propane and butanes).
Principal products: Propylene oxide, propylene glycol, dipropylene glycol, 1,3-butylene glycol, 2,3-butylene glycol, acetone, methanol, formaldehyde, formaldehyde solutions in alcohols, paraformaldehyde, trioxane, acetaldehyde, acetic acid, n-propanol, isobutanol, n-butyl alcohol, special solvents, n-propyl acetate, pentaerythritol, 3-methoxy butanol, butyraldehyde, 2-ethyl butanol, hexylene glycol, crotonaldehyde.
Personnel: Harold Blancke, president; E. T. Lindsey, plant manager.

CELANESE CORP. OF AMERICA, Pampa, Tex.
Raw materials: Natural gas, liquefied petroleum gases (propane and butanes).
Principal products: Propionic acid, methanol, acetone, acetic acid, acetic anhydride, vinyl acetate, n-propyl acetate, n-butyl acetate, butyric acid, methyl acetone, acetate methylal, methyl ethyl ketone, ethyl acetate.
Personnel: J. H. Frick, plant manager.

CELANESE CORP. OF AMERICA, Newark, N. J.
Raw materials: Petroleum cresylic acid, petroleum derived phenol, dibutyl alcohol, dioctyl alcohol.
Principal products: Tricresyl phosphate, mixed esters, triphenyl phosphate, dibutyl phthalate, dioctyl phthalate.

CELANESE CORP. OF AMERICA, Point Pleasant, W. Va.
Raw materials: Petroleum cresylic acid, phenyl, propyl alcohol, ethylene oxide, butyl alcohol, isoctyl alcohol, pentaerythritol.
Principal products: Tricresyl phosphate, dialkyl phosphate, polyester plasticizers, phenyl dicresyl phosphate, chlorinated phosphates, pentaerythritol esters.

CHEMSTRAND CORP. (Monsanto Chemical Co. and American Viscose Corp.), Decatur, Ala.
Raw material: Acrylonitrile.
Principal products: Acrylic fibers.
Personnel: Henry H. Bitler, president; F. William Koster, vice president and plant manager.

CHEMSTRAND CORP., Pensacola, Fla.
Raw materials: Petroleum-base stocks.
Principal product: Nylon. (Capacity to be increased to 88,000,000 lb. per year.)
Personnel: Fred G. Gronemeyer, plant manager.

COLUMBIA-SOUTHERN CHEMICAL CORP. (Subsid. of Pittsburgh Plate Glass Co.), Natrium, W. Va.
Raw material: Benzene.
Principal products: Chlorinated benzene, benzene hexachloride.

COLUMBIA-SOUTHERN CHEMICAL CORP., Barberton, Ohio.
Raw material: Propane.
Principal product: Perchloroethylene.
Personnel: W. G. Straub, works manager.

COMMERCIAL SOLVENTS CORP., Peoria, Ill.
Raw materials: Natural-gas fractions.
Principal products: Nitroethane, nitromethane, 1-nitropropane, 2-nitropropane, 2-nitro 1-butanol, and nitroparaffin derivatives such as aminohydroxy compounds and hydroxylamine salts. (Plants at Peoria enlarged).
Personnel: M. T. Walton, plant manager.

COMMERCIAL SOLVENTS CORP., Sterlington, La.
Raw material: Natural gas.
Principal products: Ammonia, ammonium nitrate, nitrogen solutions.
Raw materials: Hydrogen and carbon monoxide.
Principal product: Methanol.
Raw materials: Natural-gas fractions.
Principal products: Nitroethane, nitromethane, 1-nitropropane, 2-nitropropane and nitrobutane. (Plant on stream in October 1955.)

COMMERCIAL SOLVENTS CORP., Terre Haute, Ind.
Under construction.
Raw materials: Nitroparaffins.
Principal products: Nitroparaffin derivatives.

CONTINENTAL OIL CO., Baltimore.
Raw materials: Propylene tetramer and benzene.
Principal products: Alkyl aryl sulfonating stocks, including dodecylbenzene.
Personnel: L. F. McCollum, president; J. G. Hough, general superintendent, chemical manufacturing.

CONTINENTAL OIL CO., Chicago.
Raw material: Dodecylbenzene.
Principal products: Water-soluble surface-active sulfonates, including liquid, slurried, drum-dried, and spray-dried stocks (dodecylbenzenesulfonic acid type).
Personnel: K. R. Gerhardt, superintendent.

CONTINENTAL OIL CO., Ponca City, Okla.
Raw materials: Naphtha fraction; propylene.
Principal products: Benzene, toluene, propylene tetramer.
Raw material: Propylene.
Principal product: Propylene tetramer.
Personnel: Harold G. Osborn, vice president.

CONTINENTAL OIL CO., Trainer, Pa.
Raw material: Alkyl-aryl sulfonating feed stock.
Principal products: Oil-soluble surface-active sulfonates (lubricating-oil detergent additive, fuel-oil additives).
Personnel: E. W. Carlson, plant manager.

CONTINENTAL OIL CO., Lake Charles, La.
Raw material: Naphtha fraction.
Principal products: Benzene, toluene.
Raw material: Propylene.
Principal product: Propylene tetramer.
Personnel: J. M. Jones, plant manager.
1956-57 Activities: Has purchased Sherwood Refining Co., Englewood, N. J.—manufacturers of industrial chemicals.

SURVEY OF PETROCHEMICAL PLANTS

COPOLYMER RUBBER & CHEMICAL CORP., Baton Rouge, La.
Raw materials: Petroleum base stocks.
Principal products: 1,3-butadiene (grade for elastomers, 30,000 short tons per year; copolymer (G.R.-S.), 54,500 long tons per year.
Personnel: C. M. Hulings, operations vice president; H. C. Henry, process superintendent.
1956-57 Activities: Plans 30 per cent expansion of synthetic-rubber-manufacturing facilities. Modifications or additions will be made in both the rubber and the butadiene plant.

COSDEN PETROLEUM CORP., Big Spring, Tex.
Raw materials: Naphtha fractions.
Principal products: Benzene; toluene; xylene.
Raw materials: Mixed olefins.
Principal product: Polybutene—1,300,000 gal. per year.
Raw material: Aromatic naphtha.
Principal product: Kenflex resin.
Raw materials: Caustic-treating solutions.
Principal products: Ethyl; propyl; butyl mercaptans (odorants).
1956-57 Activities: Building styrene monomer unit. Capacity will be 20,000,000 lb. per year. Capital investment is $3,000,000. Completion is scheduled for December 1956.
Personnel: R. L. Tollett, president; George Grimes, superintendent.

COSDEN PETROLEUM CORP., Big Spring, Tex. (operates Phillips Chemical Co. plant).
Raw material: Xylenes mixture.
Principal product: p-xylene.

CROWN CENTRAL PETROLEUM CORP., Pasadena, Tex.
Raw material: Refinery gas stream.
Principal products: Ethylene and propylene (extracted by Shell Chemical Co.).
Personnel: S. K. Waters, president; R. S. Myers, general superintendent.

D

DELHI-TAYLOR OIL CORP., Corpus Christi, Tex.
1956-57 Activities: Planning Udex extraction unit for production of benzene, toluene, xylenes. Capacity will be 5,000 bbl. daily. Completion scheduled for June 1957.
Personnel: J. L. Sewell, president; F. A. Reneau, superintendent.

DIAMOND ALKALI CO., Pasadena, Tex. (Deer Park plant).
Raw material: Ethylene.
Principal products: Perchloroethylene; vinyl chloride; polyvinyl chloride.
1956-57 Activities: To expand perchlorethylene facilities to nearly double present capacity. Project to be completed January 1957.
Personnel: John A. Sargent, president; W. J. Butler, plant manager.

DIAMOND ALKALI CO., Pasadena, Tex. (Greens Bayou plant).
Raw material: Benzene.
Principal products: Benzene hexachloride; DDT; lindane.
1956-57 Activities: DDT being expanded.
Personnel: R. J. Koll, plant manager.

DOW CHEMICAL CO., Freeport, Tex.
Raw materials: Natural gas (major feed stock); liquefied petroleum gases; benzene.
Principal products: Ethylene and propylene oxides; ethylene, propylene, diethylene, dipropylene, tetraethylene, triethylene, and tripropylene glycols; carbon tetrachloride; chloroform; dichloroethyl, dichloroisopropyl ether; styrene, ethyl benzene; ethyl, methyl and methylene chlorides; vinyl and vinylidene chlorides; ethylene, ethylidene, and propylene dichlorides; methyl chloroform; perchloroethylene; butadiene, styrene-butadiene latex. (Some ethylene goes to Ethyl-Dow.)
Raw material: Hydrogen from chlorine cells.
Principal product: Ammonia (230 tons daily).
Raw material: Ethylene.
Principal product: Polyethylene.
Personnel: Dr. Leland I. Doan, president; Dr. A. P. Beutel, vice president and general manager.

DOW CHEMICAL CO., Midland, Mich.
Raw material: Hydrogen from chlorine cells.
Principal product: Ammonia (100 tons per day).
Raw materials: Crude oil and natural gas.
Principal products: Ethylene, propylene, styrene, butadiene, 1,3-butadiene (grade for elastomers), butadiene-butylene mixtures, methyl styrene, ethylene glycol, ethyl benzene, ethyl chloride, ethylene dibromide, diethylbenzene, polystyrene, divinylbenzene, ethylene dichloride, dichlorethyl ether, ethylene oxide, mono, di, triethanolamines, ethylene diamine, i-propylbenzene (cumene), i-propyl chloride, propylene oxide, propylene glycol, propylene dichloride, i-propanolamines, toluene 2°, polyglycols, glycol ethers, styrene-butadiene latex, saran, polyvinyl chloride, vinyltoluene. (Ethylene and propylene made from natural gas at Midland is used internally.)
Personnel: Dr. Leland I. Doan, president.

DOW CHEMICAL CO., Pittsburg, Calif.
Raw material: Hydrogen from chlorine cells.
Principal product: Ammonia (20 tons daily).
Raw material: Natural gas.
Principal product: Methylene chloride; methyl chloride; chloroform carbon tet; perchlorethylene.
Personnel: M. F. Ohman, manager of operations.

DOW CHEMICAL CO., Torrance, Calif.
Raw material: Styrene.
Principal product: Polystyrene.
Personnel: D. W. Ryan, manager.

DOW CHEMICAL CO., Allyn's Point, Conn.
Raw material: Styrene.
Principal product: Polystyrene.

DOW CHEMICAL, Co., Velasco, Tex.
Raw material: Petroleum feed stocks.
Principal product: Glycerin, rated capacity of 36,000,000 lb. per year.
1956-57 Activities: Glycerin capacity to be expanded.
Personnel: Dr. A. P. Beutel, vice president and general manager.

E. I. DU PONT DE NEMOURS & CO., Orange, Tex.
Raw materials: Ammonia, natural gas, propane, benzene, cyclohexane, adiponitrile.
Principal products: Methanol, polyethylene, adipic acid, hexamethylene-diamine (ethylene made from natural gas and/or propane is used internally).
1956-57 Activities: Expanding polyethylene facilities; modernizing adipic acid facilities.
Personnel: D. B. Campbell, manager.

E. I. DU PONT DE NEMOURS & CO., La Porte, Tex.
Raw material: Methanol.
Principal products: Carbamate fungicides, methylamines, dimethyl formamide.
Personnel: M. C. Sperry, plant manager.

E. I. DU PONT DE NEMOURS & CO., Victoria, Tex.
Raw materials: Natural gas, butadiene, small stream of ammonia.
Principal product: Adiponitrile (nylon salt basic).
Personnel: M. S. Schattuck, manager.

E. I. DU PONT DE NEMOURS & CO., Memphis, Tenn.
Raw material: Natural gas.
Principal products: Hydrogen cyanide, sodium cyanide.
Personnel: T. D. Bell, manager.

E. I. DU PONT DE NEMOURS & CO., Antioch, Calif.
Raw material: Petroleum base stock.
Principal products: Tetraethyl lead, fluorinated hydrocarbons (facilities under construction).
1956-67 Activities: Planning additions to facilities now under construction: ethyl chloride, trichlorethylene, perchlorethylene.

E. I. DU PONT DE NEMOURS & CO., Beaumont, Tex.
New plant for chlorosulfonated polyethylene synthetic rubber to be completed in first part of 1957.

SURVEY OF PETROCHEMICAL PLANTS

D-X SUNRAY OIL CO., Duncan, Okla.
Raw material: Refinery gases.
Principal product: Proylene tetramer.
Personnel: R. W. McDowell, president; R. L. Johnson, plant manager.

E

EASTERN STATES CHEMICAL CORP., Houston Tex.
Raw materials: Naphtha fractions.
Principal products: Benzene-2°, various aromatic solvents.
Personnel: R. B. Kahle, president; O. K. Coward, superintendent.

EASTERN STATES PETROLEUM CO., INC., Houston
Raw material: Refinery streams.
Principal products: (1-butene, 2-butene and mixtures, isobutylene); propane; n-butane; isobutane; isopentane.

ENJAY CO. (See Esso Standard.)

ESCAMBIA BAY CHEMICAL CORP., Pensacola, Fla.
1956-57 Activities: 30,000,000 lb. per year polyvinyl (See Table 2). Chloride plant to be completed in November 1956. Total plant investment (ammonia, etc.) $24,000,000 by end 1956.

ESSO STANDARD OIL CO., Baton Rouge, La.
Raw materials: Natural gas; refinery gas streams, and liquid fractions.
Principal products: Aromatic distillates and solvents; aromatic tars, ethane and ethylene, propane and propylene, 1,3-butadiene, isobutylene, isoprene, tripropylene, ethanol, isopropanol isooctanol, decanol, tridecanol, ethyl ether, isopropyl ether, dicyclopentadiene, benzene, butyl rubber (47,000 long tons per year), tetrapropylene, acetone (from isopropyl alcohols), petroleum resins, normal butylene.
Personnel: S. C. Hope, president; C. C. Garvin, Jr., manager chemical products division.

ESSO STANDARD OIL CO., Linden, N. J.
Raw materials: Refinery gas streams and liquid fractions.
Principal products: Naphthenic acids, isobutylene, polyisobutylenes, isopropanol, sec.-butanol, isopropyl acetate, sec.-dibutyl acetate, methly ethyl ketone, acetone, isopropyl ether, lube oil additives.
1956-57 Activities: Refinery gas streams to ethylene, to be completed end of 1956.
Personnel: C. C. Swooper, superintendent.

ETHYL CORP., Baton Rouge, La.
Raw materials: Ethane, ethylene (ethylene dibromide from Ethyl-Dow).
Principal products: Tetraethyl lead, ethyl chloride, ethylene dichloride.
Personnel: E. L. Shea, president; Roy N. Clothier, plant manager.

ETHYL CORP., Pasadena, Tex.
Raw materials: Ethylene (ethylene dibromide from Ethyl-Dow).
Principal products: Tetraethyl lead, ethyl chloride, ethylene dichloride.
Personnel: G. O. Hayes, plant manager.

ETHYL-DOW CHEMICAL CO., INC., Freeport, Tex.
Raw materials: Ethylene.
Principal products: Ethylene dibromide.
Personnel: Dr. A. P. Beutel, vice president and general manager.

F

FIRESTONE PLASTIC CO. (Div. of Firestone Tire & Rubber Co.), Pottstown, Pa.
Raw materials: Petroleum-base stocks.
Principal products: Polybutadiene-acrylonitrile-type (N-type) acrylic elastomers; polybutadiene-styrene-type acrylic elastomers; vinyl resins.
Personnel: Roger S. Firestone, president.

FIRESTONE TIRE & RUBBER CO., Akron, Ohio.
Principal products: Copolymer (G.R.-S.), 40,000 long tons per year.

FIRESTONE TIRE & RUBBER CO., Lake Charles, La.
Principal products: Copolymer (G.R.-S.), 150,000 long tons per year.

FIRESTONE TIRE & RUBBER CO., Orange, Tex.
1956-57 Activities: Will build butadiene plant with capacity of 40,000 tons yearly, to be completed in 1957. Will build styrene plant with 75,000 tons capacity yearly, to be completed in 1958.

FOOD MACHINERY & CHEMICAL CORP., Houston.
Principal product: Butadiene, 90,000 short tons per year.

FOSTER GRANT CO., INC., Baton Rouge, La.
Raw materials: (From Esso Standard Oil Co. refinery), benzene, ethylene.
Principal product: Styrene. 2,000,000 lb. per month. Plant investment $4,000,000.
Personnel: Dr. F. D. Mayfield, plant manager.
1956-57 Activities: Plant being expanded.

FOSTER GRANT CO, INC., Leominster, Mass.
Raw material: Styrene.
Principal product: Polystyrene.
Personnel: Joseph C. Foster, president.

G

GENERAL ANILINE & FILM, Linden, N. J.
Raw material: Ethylene from Esso Standard.
Principal product: Ethylene oxide, ethylene glycol.
1956-57 Activities: Plant to be built at cost of $8,000,000, ethylene oxide capacity 60,000,000 lb. per year.

GENERAL PETROLEUM CORP., Ferndale, Wash.
Raw materials: Refinery streams.
Principal products: Sodium sulfide sludge.
Personnel: C. C. Cortelyou, plant manager.

GENERAL PETROLEUM CORP., Torrance, Calif.
Raw materials: Refinery streams.
Principal products: Sodium cresylic sludge, crude naphthenic acids (transported to Vernon, Calif., plant for processing into highly refined naphthenic acids and metallic naphthenates); ammonium sulfate (10 tons per day capacity); hydrogen sulfide (in commercial amine solution).
Personnel: R. L. Minckler, president; A. E. Thompson, plant manager.

GENERAL TIRE & RUBBER CO., Mogadore, Ohio.
Raw materials: Petroleum-derived materials.
Principal products: Polybutane-styrene-vinylpyridine-type acrylic elastomers.
Personnel: J. A. Kleinhans, manager.

GENERAL TIRE & RUBBER CO., Ashtabula, Ohio.
Raw material: Acetylene.
Principal product: Polyvinyl chloride.
Personnel: J. A. Pollock, manager.

GENERAL TIRE & RUBBER CO., Akron.
Raw material: Petroleum base stocks.
Principal product: Polybutadiene-acrylonitrile (N-type) acrylic elastomers.
Personnel: W. O'Neil, president; A. L. Antonio, general manager.

GENERAL TIRE & RUBBER CO., Avon Lake, Ohio.
Raw material: Acetone.
Principal product: Ketone.
Raw material: Formaldehyde.
Principal product: Propiolactone, acrylic acid.
Raw materials: Oxo alcohols.
Principal products: Plasticizers.

GENERAL TIRE & RUBBER CO., Calvert City, Ky.
Raw product: Natural gas.
Principal product: Acrylonitrile hydrogen (also uses acetylene from Air Reduction Co.'s carbide plant).

GENERAL TIRE & RUBBER CO., Louisville, Ky.
Raw materials: Propane; petroleum base stocks.

Principal products: Hydrogen; polybutadiene-acrylonitirle (N-type) acrylic elastomers.

GOODRICH, B. F., CHEMICAL CO., Calvert City, Ky.
Raw materials: Petroleum-derived stocks.
Principal product: Special rubbers.
Personnel: W. E. Brodine, manager.
NOTE: Special rubbers are made at Akron, Calvert City, and Louisville plants including acrylonitrile butadine rubbers, brominated butyl rubber, carboxylic nitrile rubber, liquid G.R.-S. butadiene styrene rubber, polyacrylic rubber.

GOODRICH, B. F., CHEMICAL CO., Akron.
Raw materials: Petroleum-derived stocks.
Principal products: Polybutadiene-acrylonitrile (N-type) acyclic elastomers.
Personnel: C. B. Cooper, manager.

GOODRICH, B. F., CHEMICAL CO., Avon Lake, Ohio.
Raw materials: Acetone, oxo alcohols.
Principal products: Ketene; plasticers from oxo alcohols.
Personnel: O. F. Beckmeyer, manager.

GOODRICH, B. F., CHEMICAL CO., Louisville, Ky.
Raw materials: Petroleum-derived stocks.
Principal products: Butadine acrylonitrile rubbers, other rubbers.
Personnel: J. L. Nelson, manager.

GOODRICH-GULF CHEMICALS, INC., Port Neches, Tex.
Raw materials: Petroleum-feed streams.
Principal product: 1,3-Butadiene (grade for elastomers).
Personnel: W. R. Bateman, plant manager.

GOODYEAR TIRE & RUBBER CO., Akron.
Raw materials: Petroleum-base stocks.
Principal products: Butadiene-acrylonitrile (N-type) elastomers, (rubbers and latices); high-styrene-type resins (point bases, rubber reinforcers, molding resins); styrenated products.
Personnel: C. J. Thomas, president.

GRACE, W. R., & CO., Baton Rouge, La. (See also Table 2.)
Building polyethylene plant at Baton Rouge. Completion set for mid-1957. Probable investment $18,000,000.

GREAT SOUTHERN CHEMICAL CORP., Pontiac Refining Corp., The Chicago Corp., La Gloria Oil & Gas Corp., and Gulf Oil Corp., Corpus Christi, Tex.
Raw material: Butane.
Principal products: Butylene concentrate.
Raw material: Nathpha fractions.
Principal products: Benzene, toluene, and xylene.

GRIFFIN CHEMICAL DIV. (See Nopco Chemical Co.

GULF OIL CORP., Port Arthur, Tex.
Raw materials: Refinery gases, heptene, other refinery streams.
Principal products: Ethylene (1,000,000 lb. daily), isooctyl alchohol, naphthenic acides, butylenes, sulfur (60 tons daily).
1956-57 Activities: Expanding sulfur plant capacity to 120 tons daily. Completion set for 1957. Four new sludge and decomposing units being added.
Personnel: W. K. Whiteford, president; R. C. Faulkner, general superintendent.

H

HERCULES POWDER CO., Gibbstown, N. J. (See also Table 2).
Raw materials: Propylene, benzene.
Principal products: Phenol, acetone, cumene, cumene hydroperoxide, acetophenone, a-methylstyrene. (Hercules also makes dimethylterephthalate from paraxylene at Burlington, N. J.
Personnel: L. W. Rochenberger, superintendent.

HERCULES POWDER CO., Louisiana, Mo.
Raw materials: Ammonia, methanol, acetone.
Principal products: Methyl methacrylate.
1956-57 Activities: Planning 35,000,000 lb. per year of monomer and polymer. Cost $11,000,000.

HEYDEN CHEMICAL CORP., Texas City, Tex.
Part owner with Monsanto Chemical in methanol plan. (See Monsanto).

HIDALGO CHEMICAL CO. (Stanolind Oil & Gas Co.), Brownsville, Tex. (plant undergoing rehabilitation.)
Raw materials: Natural gas to Fischer-Tropsch synthesis products.
Personnel: L. L. Smith, chemical plant manager.

HUMBLE OIL & REFINING CO., Baytown, Tex.
Raw materials: Refinery steams.
Principal products: Toluene, solvent xylene, paraxylene, high-boiling aromatic solvents, narrow-boiling range aliphatic naphthas (hexane, heptane, and octane), special naphthas, cyclohexane, tetrapropylene, tripropylene, butylene concentrate, butyl rubber, H_2S concentrate for sulfur manufacture and carbon black feed stock.
1956-57 Activities: Expanding butadiene capacity by 16,000 short tons per year. Completion set for first quarter 1957.
Personnel: Hines H. Baker, president; G. L. Farned, plant manager.

I

INDEX CHEMICAL CO. (Subsidiary of Pennsylvania Salt Manufacturing Co.), Houston.
Raw materials: Natural gas, natural butane, methyl alcohol, ethyl alcohol.
Principal products: Methyl mercaptan, ethyl mercaptan, thiophene.
Personnel: Dr. H. I. Cramer, vice president; T. B. Hudson, plant superintendent.

INDOIL CHEMICAL CO. (See Standard Oil Co. of Indiana.)

J

JEFFERSON CHEMICAL CO., INC., Port Neches, Tex.
Raw materials: Refinery gases (ethane and propane streams from The Texas Co. Port Arthur plant); propylene polymer from The Texas Co.; and phenol.
Principal products: Ethylene oxide; ethylene, diethylene, and triethylene glycols; polyethylene glycols; etanolamines; ethylene carbonate; propylene carbonate; morpholine; nonyl phenol; ethylene oxide—nonyl phenol condensates. (Ethylene made at Port Arthur from refinery gases and/or L.P.G. is used internally).
Personnel: M. H. Holmes, plant manager.

K

KENDALL REFINING CO., Bradford, Pa.
Raw materials: Petroleum fractions.
Principal products: Heavy hydrocarbons (petroleum polymer and condensation resins).
Personnel: J. B. Fisher, president and general manager.

KOPPERS CO., INC. (Chemical Div.), Port Arthur, Tex.
Raw materials: Ethylene.
Principal products: Ethylbenzene; polyethylene.
Personnel: Fred C. Foy, president; H. E. Roche, plant manager

KOPPERS CO., INC. (Chemical Div.), Kobuta, Pa.
Raw material: Ethylbenzene.
Principal products: Styrene, polystyrene, polyethylene (Ziegler process).
1956-57 Activities: Planning 30,000,000 lb. per year low-pressure polyethylene at Woodridge Township, N. J.; building $10,000,000 polyethylene plant with Brea Chemical Co. near Los Angeles with ultimate capacity of 60,000,000 lb. per year. To be completed by mid-1957.

SURVEY OF PETROCHEMICAL PLANTS

L

LUBRIZOL CORP., Pasadena, Tex.
Raw materials: Petroleum fractions.
Principal products: Petroleum sulfonates (barium and calcium salts); other lube-oil additives.
Personnel: K. E. Danskin, general manager; R. L. Carll, production manager.

LUBRIZOL CORP., Cleveland.
Raw material: Petroleum fractions.
Principal products: Petroleum sulfonate; lube-oil additives.
Personnel: M. R. Clapp, assisctant manager, manufacturing; C. G. O'Bannon, production manager.

M

MAGNOLIA PETROLEUM CO., Beaumont, Tex.
Raw materials: Petroleum fractions.
Principal products: Cresylic acid, sodium cresylate solutions.
Personnel: J. L. Latimer, president; C. M. Fabian, general superintendent.

MARBON CHEMICAL DIV. (Borg-Warner Corp.) two plants, Gary, Ind.
Raw materials: Acrylonitrile, butadiene, styrene.
Principal products: High-styrene resins, high impact thermoplastic molding material.
Personnel: Robert Shattuck, president and general manager; J. F. Showalter, plant superintendent.

MARBON CHEMICAL DIVISION (Borg-Warner Corp.), Parkersburg, W. Va.
1956-57 Activities: Building 10-million-dollar plant. Completion set for first quarter 1957.

MERICHEM CO., Houston.
Raw materials: Refinery byproduct streams.
Principal products: Phenols, cresols, cresylic acid, sodium sulfide.
Personnel: J. T. Files, vice president and general manager.

MISSISSIPPI RIVER CHEMICAL CO. (See Table 2.)

MONSANTO CHEMICAL CO., Avon, Calif.
Raw material: Benzene.
Principal products: Phenol (by sulfonation).
Personnel: C. A. Thomas, president; Don Danna, plant manager.

MONSANTO CHEMICAL CO., Texas City, Tex.
Raw materials: Natural gas and propane, benzene.
Principal products: Ethylbenzene, styrene, ethylene dichloride, vinyl chloride, acrylonitrile, hydrogen cyanide; toluene-2° is small byproduct stream. (Acetylene from natural gas and ethylene from natural gas and/or propane made at Texas City are used internally), tertiarybutylamine.
Raw material: Ethylene.
Principal product: Polyethylene.
1956-57 Activities: Building facilities to produce from n-butane, ethylene for internal use (butylenes, and butadiene as byproduct streams).
Personnel: R. D. Dunlop, assistant general manager.

MONSANTO CHEMICAL CO., Texas City, Tex. (Heyden Chemical Corp. part owner).
Raw materials: Byproduct hydrogen and carbon monoxide from acetylene synthesis.
Principal product: Methanol.

MONSANTO CHEMICAL CO., LION OIL DIVISION, Luling, La. (See Table 2.)
1956-57 Activities: Building new plant to process adipic acid, cost several million dollars. Completion due early 1957.

MONTROSE CHEMICAL CO., Newark, N. J.
Raw material: Petroleum cresylic acid.
Principal product: Tricresyl phosphate.
Personnel: P. Rothberg, president; F. G. Radis, plant superintendent.

N

NATIONAL PETROCHEMICALS CORP. (National Distillers Products Corp. and Panhandle Eastern Pipeline Co.), Tuscola, Ill.
Raw materials: Natural gas (ethane) (natural-gas liquids extraction plant in Tuscola).
Principal products: Ethanol, ethyl ether and ethyl chloride. (Ethylene made here is used internally), 350 tons daily.
Raw material: Ethylene.
Principal product: Polyethylene.
1956-57 Activities: Expanding ethylene capacity to 450 tons daily; polyethylene to 100,000,000 lb. yearly. Completion set for last quarter 1957.
Personnel: J. E. Bierwirth, president; G. A. Siegelman, assistant plant manager.

NATIONAL DISTILLERS PRODUCTS CORP. (See Table 2.)

NATURAL GAS ODORIZING CO., INC., Houston.
Raw materials: Petroleum fractions.
Principal products: Ethyl, higher mercaptans. (Specialized odorants for natural and L. P. gas).
Personnel: J. H. Gill, general manager.

NAUGATUCK CHEMICAL, Naugatuck, Conn.
Raw materials: Styrene, butadiene, acrylonitrile.
Principal products: S-type rubber, styrene copolymers.
Personnel: John E. Caskey, vice president and general manager; J. N. Judy, chemical products superintendent.

NAUGATUCK CHEMICAL, Baton Rouge, La.
Raw materials: Styrene, butadiene acrylonitrile.
Principal products: N-type rubber, styrene copolymers.
Personnel: J. M. Poynter, production superintendent.

NEVILLE CHEMICAL CO., Neville Island, Pa.
Raw materials: Unsaturated petroleum fractions.
Principal products: Aromatic petroleum solvents, heat reactive resins, and thermoplastic resins.
Personnel: Lee V. Dauler, president; H. J. Shearer, superintendent.

NEVILLE CHEMICAL CO., Anaheim, Calif.
Raw materials: Unsaturated petroleum fractions.
Principal products: Aromatic petroleum solvents, oxidizing resins, and thermoplastic resins.
Personnel: Robert L. Ulrich, manager.

NINOL LABORATORIES, INC., Chicago.
Raw materials: Dodecylbenzene; diethanolamine.
Principal products: Dodecylbenzene sulfonates; alkylolamide detergents.
Personnel: J. Kritchevsky, president.

NOPCO CHEMICAL CO. (Griffin Chemical Div.), Richmond, Calif.
Raw materials: Petroleum fractions.
Principal products: Naphthenic acid; petroleum sulfonates (emulsifying agents).
Personnel: Walter P. Ruedrich, manager.

O

ODESSA BUTADIENE CO. (See Table 3.)

OHIO-APEX DIV., FOOD MACHINERY & CHEMICAL CO., Nitro, W. Va.
Raw material: Petroleum cresylic acid.
Principal products: Tricresyl phosphate. (Plant also makes plasticizers such as dioctyl phthalate and diallyl phthalate monomer from isooctyl, allyl and other alcohols).
Personnel: Borden E. Gewin, plant superintendent.

OLIN-MATHIESON CHEMICAL CORP., Brandenburg, Ky.
Raw materials: Natural-gas liquids (ethane) from Tennessee Gas Transmission Co. low-temperature liquids-extraction plant at Greensburg, Ky.
Principal products: Ethylene oxide; ethylene, diethylene, and triethylene glycols; polyethylene glycols; ethylene dichlo-

ride; ethylene glycol ethers; ethanolamines; dichlorethyl ether; aromatic distillates and solvents.
Personnel: Thomas P. Nichols, president; J. G. Woods, general manager.

OLIN-MATHIESON CHEMICAL CORP. (formerly Matholin Corp.), Lake Charles, La.
Raw materials: Hydrocarbons.
Principal product: Hydrazine.

ORONITE CHEMICAL CO. (See also Standard Oil Co. of California), Oak Point, La.
Raw material: Petroleum-base stocks.
Principal product: Lube-oil additives, furnace-oil additive, gas odorants, nonionic detergents, algicides, alkyl phenols.

P

PAN AMERICAN CHEMICALS CORP., Texas City, Tex. **(American Oil Co.)**
Raw materials: Petroleum-base stocks.
Principal products: Benzene-2°, toluene, xylenes, hydrocarbon resins (petroleum polymer and condensation resins), aromatic solvents, drying oils, alkylated naphthalenes, nonene, heptene, methyl mercaptan.
Personnel: E. M. Schulze, division superintendent of operations.

PAN-AM SOUTHERN CORP., El Dorado, Ark.
Raw materials: Refinery streams.
Principal products: Propylene tetramer, polybutenes.
1956-57 Activities: Building a polybutene unit at Destrehan, La., refinery. Capacity will be 250 bbl. per stream day; investment, $1,050,000. Completion is scheduled for the end of 1956.
Personnel: Bruce K. Brown, president; E. N. Kimes, manager.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP., Chester, Pa.
Raw materials: Petroleum-base stocks.
Principal products: Petroleum polymer and condensation resins.
Personnel: B. T. Schwalm, vice president.

PENNSYLVANIA REFINING CO., Karns City, Pa.
Raw materials: Lube-oil distillates.
Principal products: Petroleum sulfonates, 5,000,000 lb. yearly.
Personnel: Paul R. Beck, president; John A. Beck, Jr., refinery manager.

PETROCARBON CHEMICALS, INC., Irving, Tex.
Raw material: Catalytic reformate (from naphtha fractions).
Principal products: Partial aromatic solvents, aliphatic solvents.
Personnel: S. J. Cohen, president; Joseph Shoaf, plant superintendent.

PETROLEUM CHEMICALS, INC. (Cities Service Oil Co., and Continental Oil Co.), Lake Charles, La.
Raw materials: Petroleum feed stocks.
Principal products: 1,3-butadiene (grade for elastomers), 63,000 short tons yearly; 1-butene, 2-butene and mixtures.
Personnel: Bruce K. Brown, president; F. M. Simpson, vice president.
1956-57 Activities: Adding propylene separation unit with a capacity of 8,500 bbl. yearly, at a cost of $200,000. Completion scheduled for October 1956. Expanding butadiene capacity by 16,000 tons yearly, at a cost of $4,500,000. Building new plant to produce 100,000 tons of anhydrous ammonia per year. Plant will cost $12,500,000. Completion scheduled for October 1957. Also plan new ethylene plant.

PETRO-TEX CHEMICAL CORP. (see Table 3).

PHILLIPS CHEMICAL CO., Sweeny, Tex. (See also Tables 2, 3, 4, 5.)
1956-57 Activities: Has under construction a butane unit to produce ethylene, 145,000,000 lb. per year.

PHILLIPS CHEMICAL CO., Pasadena, Tex.
Raw material: Acetaldehyde.
Principal products: Methylethylpyridine, methylvinylpyridine, mixed pyridines.
Personnel: R. G. Rhodes, manager.
1956-57 Activities: Building polyethylene plant, 110,000,000 lb. per year, low-pressure process.

PHILLIPS CHEMICAL CO. (operated by Cosden Petroleum Corp.), Big Spring, Tex.
Raw materials: Mixed xylenes.
Principal products: Para xylene.
Personnel: A. F. Legatski, plant superintendent.

PHILLIPS PETROLEUM CO., Phillips (Borger), Tex.
Raw materials: Petroleum fractions.
Principal products: Butylenes, isopentane, n-pentane, isohexanes, n-hexane, cyclohexane, n-heptane, 2,2,4-trimethylpentane, isoctanes, propylene tetramer, tert-butyl mercaptan, tert-dodecyl mercaptan, odorless thinners, rubber extender and process oils, and binder pitch.

PRODUCTOL CO., Santa Fe Springs, Calif.
Raw materials: Refinery byproduct fractions.
Principal products: Phenols, cresols, cresylic acids.
Personnel: J. W. Burrow, plant superintendent.

PURE OIL CO., Smiths Bluff, Tex.
Raw materials: Petroleum fractions; refinery gas streams.
Principal products: Petroleum polymer and condensation resins, solvents, nonparaffin concentrates, refinery gas stream (to Neches Butane Products Co.), 1-butene, 2-butene and mixtures.
Personnel: C. W. Cooper, manager.

PURE OIL CO., Toledo.
Raw materials: Petroleum fractions.
Principal products: Solvents, toluene-2°, xylene (aviation grade) and heavy mixed aromatics and polymers.
Personnel: H. H. Dornberger, manager.

R

REFINING PROCESSORS, INC., AND OIL & CHEMICAL PRODUCTS, INC., Galena Park, Tex.
Raw materials: Petroleum fractions.
Principal products: Benzene, toluene, xylene, aromatic solvent naphthas, odorless paint thinners, DDT base.
Personnel: W. E. Hildebrand, Jr., president; John Allen, superintendent.

REICHHOLD CHEMICALS, INC., Ballardvale, Mass.
Raw material: Methanol.
Principal product: Formaldehyde.

REICHHOLD CHEMICALS, INC., Charlotte, N. C.
Raw material: Methanol.
Principal product: Formaldehyde.

REICHHOLD CHEMICALS, INC., Elizabeth, N. J.
Raw material: Benzene.
Principal product: Maleic anhydride.

REICHHOLD CHEMICALS, INC., Seattle.
Raw material: Methanol.
Principal product: Formaldehyde.
Raw material: Phenol (chlorinated).
Principal product: Pentachlorophenol.

REICHHOLD CHEMICALS, INC., Tuscaloosa, Ala.
Raw material: Benzene.
Principal product: Phenol.
Raw material: Formalin-acetaldehyde.
Principal product: Pentaerythritol.
Raw material: Methanol.
Principal product: Formaldehyde.

REILLY TAR & CHEMICAL CORP., Indianapolis.
Raw material: Petroleum fractions.
Principal products: Phenols and cresols.
Personnel: C. B. Edwards, president.

REPUBLIC OIL REFINING CO., Texas City, Tex.
Raw materials: Refinery gas streams.
Principal products: Butane, butylene, propane, ethylene, and propylene tetramer; propylene trimer.
Personnel: J. M. Gardiner, president; Dillon B. Smith, superintendent.

RICHFIELD OIL CORP., Wilmington, Calif.
Raw materials: Petroleum fractions.
Principal products: Naphthenic acids.
Raw materials: Refinery cracked gases.
Principal products: Ethylene-ethane stream.
Personnel: Charles S. Jones, president; C. R. McKay, refinery manager.

ROHM & HAAS CO., Pasadena, Tex.
Raw materials: Carbon monoxide, alcohols (acetylene is from carbide).
Principal products: Acrylic monomers (methyl and ethyl acrylates).
Raw materials: Hydrogen cyanide (from natural gas and ammonia), acetone.
Principal product: Acetone cyanohydrin.
1956-57 Activities: Contracted for Texaco-Hydrocarbon Research partial oxidation process to make synthesis gas from natural gas.
Personnel: Otto Haas, president; V. C. Henrich, plant manager and vice president.

ROOSEVELT DIVISION, LEONARD REFINERIES, INC., Mount Pleasant, Mich.
Raw materials: Naphtha fractions.
Principal products: Benzene, toluene, aromatics, aliphatic naphthas and solvents.
Personnel: Reid Brazell, president; T. J. Williams, refinery manager.

S

SHARPLES CHEMICAL, INC., Wyandotte, Mich.
Raw materials: Pentane, pentane fractions, triisobutylene.
Principal products: Amyl alcohol, amyl chloride, amyl acetate, amyl phenols, amyl naphthakenes, tertiary-dodecyl mercaptans, and tertiary-dodecylthioether, 1 and 2-pentene and mixed pentenes.
Personnel: R. P. Odgen, production manager.

SHELL CHEMICAL CORP., Houston (Deer Park), Tex. (See also Tables 2, 3, 5.)
Raw materials: Petroleum hydrocarbons (propylene, ethylene, butylenes).
Principal products: Acetone, diacetone alcohol, ethyl alcohol, hexylene glycol, isopropyl alcohol, isopropyl ether, mesityl oxide, methyl ethyl ketone, methyl isobutyl carbinol, methyl isobutyl ketone, sec-butyl alcohol, allyl alcohol, allyl chloride, epichlorohydrin, ethyl chloride, glycerin, diallyl phthalate, epoxy resins (condensation polymers of epichlorohydrin and bisphenol); soil fumigant (chlorinated C_3 hydrocarbons); glycerol dichlorohydrin, trichloropropane, bisphenol-A, glycidyl phenyl ether.
Personnel: R. C. McCurdy, president; G. Purcell, plant manager.

SHELL CHEMICAL CORP., Dominguez, Calif.
Raw materials: Petroleum hydrocarbons.
Principal products: Isopropyl alcohol, acetone, methyl ethyl ketone, methyl isobutyl ketone, diacetone alcohol, sec-butyl alcohol, mesityl oxide.
Personnel: O. M. Williams, plant manager.

SHELL CHEMICAL CORP., Martinez, Calif.
Raw materials: Petroleum hydrocarbons.
Principal products: Isopropyl alcohol, acetone, methyl ethyl ketone, diacetone alcohol, methyl isobutyl ketone, ethyl amyl ketone, sec-butyl alcohol, tert-butyl alcohol, methyl isobutyl carbinol, trisubstituted phenol (2,6-di-tertiary-butyl-4-methyl-phenol—used as antioxidant), p-tert-butylbenzene acid. Sodium sulfonates (for lube-oil additives), fuel-oil additive, ethyl amyl ketone.
Personnel: E. W. Casagrande, plant manager.

SHELL CHEMICAL CORP., Denver.
Raw materials: Petroleum hydrocarbons.
Principal products: Insecticides and agricultural chemicals (aldrin, dieldrin, endrin), nemagon nematocide.
Personnel: J. G. Bejarano, plant manager.

SHELL CHEMICAL CORP., Norco, La.
Raw materials: Petroleum hydrocarbons.
Principal products: Crude chlorohydrins, allyl chloride, soil fumigant. (Construction under way for hydrogen peroxide plant—part of three-plant program. Second plant will make acrolein; third plant will make glycerin from acrolein and hydrogen peroxide.)
Personnel: F. E. Caddy, plant manager.
1956-57 Activities: Adding hydrogen peroxide facilities, to be completed early 1957, and alcohol and ketone facilities, to be completed mid-1957.

SHELL CHEMICAL CORP., Torrance, Calif.
Raw materials: Petroleum hydrocarbons.
Principal products: Butadiene (48,000 short tons per year), styrene (62,500 short tons per year), and copolymer (89,000 long tons per year), including latices.
Personnel: M. Voogd, plant superintendent.

SHELL OIL CO., Houston.
Raw materials: Naphtha fractions.
Principal products: Benzene-2°, toluene-2°.
Raw materials: Refinery streams: Propane and propylene; 1-butene, 2-butene and mixtures.
Personnel: H. S. Burns, president; J. A. Tench, manager.

SHELL OIL CO., Martinez, Calif.
Raw materials: Refinery streams.
Principal products: Cresylic acid, crude naphthenic acids, propane and propylene; 1-butene, 2-butene and mixtures; oil-layer-type petroleum sulfonate (sodium salt). (Hydrogen-rich tail gas from cat reformer to go to Pittsburg, Calif., plant for ammonia manufacture.)
Personnel: B. Stolley, manager.

SHELL OIL CO., Wilmington, Calif.
Raw materials: Refinery streams.
Principal products: Xylene-3°, mixed xylenes, propane and propylene, 1-butene, 2-butene and mixtures, cyclohexane, toluene, cresylic acid.
Personnel: P. J. Merkus, Jr., manager.

SHELL OIL CO., Wood River, Ill.
Raw materials: Naphtha fractions.
Principal products: Toluene, xylenes.
Personnel: H. D. Hale, manager.

SHELL OIL CO., Norco, La.
Raw materials: Refinery streams.
Principal product: Propylene.
Personnel: R. W. Faulk, manager.

SIMPSON COAL & CHEMICAL CO., Natchez, Miss.
1956-57 Activities: Considering a 160-ton-per-day ammonia plant as part of natural-gas-acetylene plant also making vinyl chloride monomer and polymer.

SINCLAIR CHEMICALS, INC., East Chicago, Ind.
Raw materials: Petroleum fractions.
Principal products: Antioxidants, aromatic solvents, gear-oil additives, turbine-oil additives, cutting-oil additives, cresylic acids.
Personnel: John A. Scott, president; E. W. Griscom, manager.

SINCLAIR CHEMICALS, INC., Sand Springs, Okla.
Raw materials: Petroleum fractions.
Principal products: Demulsifying agents, corrosion inhibitors, acid-layer-type petroleum sulfonate (sodium salt), and oil-layer-type petroleum sulfonate (sodium salt).

SINCLAIR CHEMICALS, INC., Marcus Hook, Pa.
Raw materials: Petroleum streams.
Principal products: Dodecene, and cresylic acids.
Raw material: Catalytic reformate.
Principal products: Aromatic hydrocarbons (toluene, p-xylene, xylene solvents, heavy aromatic solvents).
Personnel: R. J. Self, manager.

SURVEY OF PETROCHEMICAL PLANTS

SINCLAIR CHEMICALS, INC., Houston.
Raw materials: Petroleum fractions.
Principal products: Oil-layer-type petroleum sulfonates (barium, calcium and sodium salts), corrosion inhibitors, isoparaffinic odorless solvents, cresylic acids.

SINCLAIR CHEMICALS, INC., Corpus Christi, Tex.
Raw materials: Petroleum fractions.
Principal products: Aromatic solvents.
Personnel: E. B. Killick, manager.

SINCLAIR CHEMICALS, INC., Wood River, Ill.
Raw materials: Petroleum fractions.
Principal products: Aromatic solvents.

SINCLAIR CHEMICALS, INC., Wellsville, N. Y.
Raw materials: Petroleum fractions.
Principal products: Petroleum resins.
Personnel: W. B. Chenault, manager.

SOCONY MOBIL OIL CO., INC., Paulsboro, N. J.
Raw materials: Petroleum fractions.
Principal products: Sodium cresylate solutions, sodium sulfide solutions, propylene.
Personnel: B. B. Jennings, president; L. E. Cranston, manager.

SOCONY MOBIL OIL CO., INC., East Chicago, Ind.
Raw materials: Refinery streams.
Principal products: Sodium cresylate solutions, hydrogen.
Personnel: W. W. Reed, manager.

SOCONY MOBIL OIL CO., INC., East St. Louis, Ill.
Raw materials: Refinery streams.
Principal products: Sodium cresylate solutions.
Personnel: H. A. Lutz, manager.

SOCONY MOBIL OIL CO., INC., Buffalo, N. Y.
Raw materials: Petroleum fractions.
Principal products: Sodium sulfide solutions, sodium cresylate solutions.
Personnel: T. C. Lockhart, manager.

SOCONY MOBIL OIL CO., INC., Brooklyn.
Raw materials: Petroleum fractions.
Principal products: Sodium cresylate solutions.
Personnel: David Parker, manager.

L. SONNEBORN SONS, INC., Petrolia, Pa.
Raw materials: Petroleum fractions.
Principal products: Oil-layer-type petroleum sulfonate (sodium salt), water-soluble petroleum sulfonate.
Personnel: Dr. H. Schindler, manager.

SPENCER CHEMICAL CO., Orange, Tex. (See also Table 2.)
Raw material: Ethylene.
Principal product: Polyethylene, 45,000,000 lb. per year.
Personnel: F. L. Pyle, works manager.

STANDARD OIL CO. OF CALIFORNIA, El Segundo, Calif. (See also California-Spray Chemical and Oronite; see Tables 2, 3.)
Raw materials: Petroleum-base stocks.
Principal products: Benzene, toluene, paraxylene, cumene, butadiene-butylene mixtures (50,000 short tons yearly), aliphatic acids.
Personnel: D. K. Harger, general manager.

STANDARD OIL CO. OF CALIFORNIA, Richmond, Calif.
Raw materials: Petroleum-base stocks.
Principal products: Orthoxylene, metaxylene, paraxylene, industrial xylenes, alkyl aromatic detergents in various forms, metallic naphthenates, naphthenic acids, cresylic acids, petroleum sulfonates, polybutenes, gas and L.P.G. odorants, ethyl mercaptans, isophthalic, phthalic anhydride, phenol, acetone.
1956-57 Activities: Will complete in November 1956, facilities for benzoic-toluic.
Personnel: T. S. Petersen, president; C. W. Rehfuss, general manager.

STANDARD OIL CO. (IND.), Wood River, Ill.
Raw material: Heptene heartcut from olefin feed.
Principal products: Isooctyl, decyl, or higher alcohols.
Raw materials: Petroleum fractions.
Principal products: Polybutene and high-molecular-weight hydrocarbons; sodium cresylate; lube-oil detergent additives; petroleum-base plasticizers.
Personnel: H. E. Cotton, manager.

STANDARD OIL CO. (IND.), Sugar Creek, Mo.
Raw materials: Petroleum fractions.
Principal products: C_7 olefin concentrate; sodium cresylate.
Personnel: H. R. Boehmer, manager.

STANDARD OIL CO. (IND.), Whiting, Ind.
Raw materials: Petroleum fractions.
Principal products: Benzene-1°; solvent grade toluene, xylenes; acid-layer type petroleum sulfonate; detergent alkylate; sodium cresylate; also supply refinery gases to other chemical manufacturer.
Personnel: A. F. Endres, manager.

STAUFFER CHEMICAL CO., Louisville, Ky.
Raw materials: Propane, propylene.
Principal products: Carbon tetrachloride, perchlor-ethylene, hydrogen chloride, chloroform, methylene chloride.
1956-57 Activities: Plant currently being expanded. To be completed, spring 1957.
Personnel: H. Stauffer, president; H. C. Kutz, manager.

STAUFFER CHEMICAL CO., Le Moyne, Ala.
Raw material: Natural gas.
Principal product: Carbon disulfide.

STAUFFER CHEMICAL CO., Dominguez, Calif.
Raw materials: Hydrogen sulfide, sludge acid.
Principal product: Sulfuric acid.

STAUFFER CHEMICAL CO. (Consolidated Chemical Div.), Baton Rouge, La.
Raw materials: Hydrogen sulfide.
Principal products: Sulfur.
Personnel: A. L. Evans, plant manager.

STAUFFER CHEMICAL CO. (Consolidated Chemical Div.), Houston.
Raw material: Sludge acid.
Principal product: Sulfuric acid.
Personnel: W. J. Daspit, plant manager.

SUN OIL CO., Marcus Hook, Pa. (See also Table 2.)
Raw materials: Refinery streams.
Principal products: Petroleum sulfonates, naphthenic acids, propylene tetramer (dodecene), propylene trimer (nonene), sulfur, benzene, toluene, xylene.
Personnel: Wilburn T. Askew, manager.

SUN OIL CO., Toledo.
Raw materials: Refinery streams.
Principal products: Butylenes, propylene tetramer (dodecene), hydrogen.
Personnel: Robert G. Dunlop, president; John F. Harron, manager.

SUNTIDE REFINING CO., Corpus Christi, Tex.
Raw material: Propylene.
Principal product: Tetramer (150,000 bbl. per year).
Raw material: Naphtha.
Principal products: Benzene (140,000 bbl. per year), toluene (315,000 bbl. per year), xylene (550,000 bbl. per year).
1956-57 Activities: Has under construction a 15,000-bbl. per day Rexformer and Unifiner, to be completed May 1957. Estimated cost is $5,000,000.
Personnel: F. L. Martin, president; J. E. Harrell, superintendent.

T

TENNESSEE EASTMAN CO. (Div. of Eastman Kodak Co.), Kingsport, Tenn.
Raw materials: Ethanol, isobutyraldehyde, normal-butyraldehyde, isobutyl alcohol, 2-ethylhexyl alcohol, 2-ethyl isohexanol alcohol, isobutyronitrile, polyethylene.
Principal products: Acetic and butyric acids and anhydrides.

acetaldehyde, acetanilide, n-butyl acetate, crotonaldehyde, dibutyl phthalate, diethyl phthalate, di-2-ethylhexyl phthalate, di-2-ethylhexyl adipate, di-isobutyl adipate, di-2-ethylhexyl sebacate, di-isobutyl phthalate, ethyl acetate, isobutyl acetate, isopropyl acetate, triethyl phosphate.
Raw materials: Acetic and butyric acids and anhydrides.
Principal products: Cellulose acetate and cellulose acetate butyrate.
Raw materials: Cellulose esters.
Principal products: Cellulose acetate textile fibers, Tenite acetate and Tenite butyrate plastics, plasticizers.
Personnel: James C. White, president.

TEXAS BUTADIENE & CHEMICAL CORP., Houston.
1956-57 Activities: Has plant under construction. Raw materials will be n-butane (Houdry catalytic dehydrogenation of n-butane as basic step), isobutane, isopentane. Principal products will be butadiene (65,000 tons per year), chemical-grade butylenes, aviation gasoline (83,000 bbl. motor alkylate and 2,500,000 bbl. of 115/145 grade avgas). Completion is scheduled for late 1956.
Personnel: E. L. Green, Jr., president.

THE TEXAS COMPANY, Port Arthur, Tex. (See also Table 2.)
Raw materials: Refinery fractions.
Principal products: Naphthenic acid, oil-layer-type petroleum sulfonates; ethane-ethylene stream; propane-propylene mixture; 1-butene, 2-butene and mixtures; heavy hydrocarbons; olefin polymers.
1956-57 Activities: Has under construction a lubricating-oil-additives plant to be completed January 1, 1957.
Personnel: A. C. Long, president; L. C. Kemp, Jr., general manager, petrochemicals.

TEXAS EASTMAN CO. (Div. of Eastman Kodak Co.), Longview, Tex.
Raw materials: Propane, natural gas.
Principal products: Ethanol, isobutyraldehyde, normal-butyraldehyde, isobutyl alcohol, 2-ethylhexyl alcohol, 2-ethyl isohexanol alcohol, isobutyronitrile, polyethylene.
1956-57 Activities: Oxo facilities being expanded to increase butyraldehydes capacity. Has under construction facilities to produce polyethylene from ethylene, expanding to 40,000,000 lb. per year.
Personnel: James C. White, president.

TEXAS-U. S. CHEMICAL CO., Port Neches, Tex.
Raw materials: Butadiene, styrene.
Principal products: Copolymer, butadiene (112,000 long tons per year), styrene-type synthetic rubbers.
Personnel: W. P. Gee, president; T. A. McCoy, manager.

TEXAS-U. S. CHEMICAL CO., (owned jointly with Goodrich-Gulf Chemicals, Inc., and operated by Neches Butane Products Co.), Port Neches, Tex.
Raw materials: Butylenes.
Principal products: Butadiene (190,000 short tons per year).

THOMPSON CHEMICAL CO., Attleboro, Mass.
1956-57 Activities: Expect to complete by October 1, 1956, a plant to produce polyvinyl chloride resin from vinyl chloride monomer.

U

UNION OIL CO. OF CALIFORNIA, Santa Maria, Calif.
Raw material: Natural gas.
Principal products: Dry ice and liquid CO_2 (18,250 tons yearly; capital investment, $825,000).
Personnel: Jack Stair, plant manager.
Raw materials: Refinery gases and wastes.
Principal products: Sulfur (2 plants—30,000 tons yearly; capital investment, $1,200,000).
Personnel: R. A. McKean, plant manager.

UNION OIL CO. OF CALIFORNIA, Wilmington, Calif.
Raw materials: Refinery gases and wastes.
Principal products: Methyl and ethyl mercaptans (500,000 lb. yearly; capital investment, $200,000); sulfur (14,000 tons yearly; capital investment, $600,000); ammonium sulfate (20,000 tons yearly; capital investment, $1,000,000).
Personnel: Reese H. Taylor, president; J. W. Towler, plant manager.

UNIVERSAL DETERGENTS, INC., Long Beach, Calif.
Raw materials: Petroleum fractions.
Principal products: Alkyl aryl sulfonates, aromatic solvents.
Personnel: A. Danciger, president; M. Levine, vice president and general manager.

V

VELSICOL CORP., Marshall, Ill.
Raw materials: Petroleum-base stocks.
Principal products: Benzene-1°, benzene-motor grade, toluenes; xylenes; high-boiling aromatic petroleum solvents, petroleum-derived formulation solvents, hydrocarbon polymers and resins.
Personnel: W. E. Camp, plant manager.

VISCO PRODUCTS CO., INC., Sugarland, Tex.
Raw materials: Petroleum fractions; petroleum chemicals.
Principal products: Crude-oil desalting and dehydrating chemicals; special oxyalkylated compounds.
Personnel: Dr. W. H. Kirkpatrick, vice president, technical division.

VISCO PRODUCTS CO., INC., Anaheim, Calif. (under construction).
Raw materials: Petroleum fractions; petroleum chemicals.
Principal products: Crude-oil desalting and dehydrating chemicals.
Personnel: Earl T. Kocher, chief chemist and plant manager.

W

WARREN PETROLEUM CORP., Conroe, Tex.
Raw materials: Liquefied petroleum gas (propane, butane).
Principal products: Pentaerythritol, methanol, and acetaldehyde.
Personnel: K. A. Fisher, superintendent.

WITCO CHEMICAL CO., Chicago.
Raw materials: Petroleum naphthenic acid.
Principal products: Metallic naphthenates (paint drying agents and lube additives).
Raw material: Petroleum wax.
Principal products: Sun checking inhibitors (rubber compounding).
Raw materials: Asphalt fractions.
Principal products: Rubber extenders, saturating compounds, insulating mastics.
Personnel: Max A. Minnig, president; S. C. Trimble, manager.

WITCO CHEMICAL CO., Perth Amboy, N. J.
Raw materials: Solid petroleum tar; heavy-liquid and semi-solid petroleum fractions.
Principal products: Rubber extenders; extending plasticizer; rubber softeners.
Personnel: J. R. Burgess, manager.

WITCO CHEMICAL CO., Lawrenceville, Ill.
Raw materials: Solid petroleum tar; heavy-liquid and semi-solid petroleum fractions.
Principal products: Rubber extenders; extending plasticizer; rubber softeners.
Personnel: F. C. Cullom, superintendent.

WYANDOTTE CHEMICALS CORP., Wyandotte, Mich.
Raw materials: Petroleum fractions and derivatives.
Principal products: Alkyl aryl sulfonates, ethylene glycol, diethylene glycol, ethylene dichloride, polyoxyalkylene compounds, chloroethers, aromatic distillates and solvents (chlorinated solvents).
Personnel: Robert B. Semple, president; Arthur D. Tucker, manager of production.
1956-57 Activities: Has bought site on Mississippi River 25 miles south of Baton Rouge near Geismar, Ascension Parish, Louisiana, for multimillion-dollar ethylene oxide plant. Ethylene to come from Esso Baton Rouge refinery. Plant to go on stream late 1957; initial cost about $8,000,000.

TABLE 2—NITROGEN-CHEMICAL MANUFACTURE

A

ALLIED CHEMICAL & DYE CORP., South Point, Ohio.
Raw material: Natural gas.
Principal products: Ammonia (725 tons per day); urea; nitrogen solutions; high-analysis mixed fertilizer; methanol; formaldehyde and urea-formaldehyde concentrate.
Personnel: C. W. Bahrt, Jr., plant manager.

ALLIED CHEMICAL & DYE CORP., Hopewell, Va.
Raw material: Natural gas.
Principal products: Ammonia (935 tons per day), ammonium nitrate—limestone, nitrogen solutions, sodium nitrate and nitrogen tetroxide.
1956-57 Activities: Installing facilities for solid ammonium nitrate, 1956 completions.
Personnel: F. A. Ernst, plant manager.

ALLIED CHEMICAL & DYE CORP., La Platte (Omaha) Neb.
Raw material: Natural gas.
Principal products: Ammonia (210 tons per day), urea, nitrogen solutions.

AMERICAN CYANAMID CO., Avondale, La. (Fortier plant.)
Raw material: Natural gas.
Principal products: Ammonia (300 tons per day); ammonium sulfate.
Personnel: K. C. Towe, president; C. F. Bonnet, plant manager.

ATLANTIC REFINING CO., Philadelphia, Pa.
Raw material: Byproduct hydrogen from cat reformer.
Principal product: Ammonia, 100 tons per day.
Personnel: W. O. Hoffman, superintendent chemical manufacturing; W. E. Chalfort, assistant superintendent chemical manufacturing.

B

BREA CHEMICALS, INC., (subsidiary Union Oil Co.), Brea, Calif.
Raw material: Natural gas.
Principal products: Ammonia (300 tons per day); dry ice and liquid CO_2, (70 tons per day); Ammonium nitrate, ammonium phosphate.
Personnel: Homer Reed, president; J. W. Miller, executive vice president.

C

CALUMET NITROGEN PRODUCTS CO., Hammond, Ind., (operated by Standard Oil Co. (Ind.)
Raw material: Natural gas.
Principal products: Anhydrous ammonia and solutions 300 tons per day.
Personnel: J. H. Forrester, president.

COMMERCIAL SOLVENTS CORP., Sterlington, La.
Raw material: Natural gas.
Principal products: Ammonia (400 tons per day); ammonium nitrate, nitrogen solutions, methanol, nitroparaffin derivatives (see Table 1).
1956-57 Activities: $10,000,000 expansion of methanol and petrochemical derivatives at Sterlington, La.
Personnel: W. W. Jackson, vice president petrochemical division.

CALIFORNIA-SPRAY CHEMICAL CORP., Richmond, Calif., (subsidiary Standard Oil Co. of California).
Raw materials: Natural and refinery gases.
Principal products: 300 tons per day ammonia; 250 tons per day nitric acid; ammonium sulfate, amonium nitrate, fertilizer solutions.
Personnel: J. H. Cole, superintendent of chemical division.

COOPERATIVE FARM CHEMICALS ASSOCIATION, Lawrence, Kans.
Raw material: Natural gas.
Principal products: Ammonia (180 tons per day), ammonium nitrate, and nitrogen solutions.
Personnel: Howard A. Cowden, president; R. R. Zurbuchen, general manager.

D

DEERE & CO., (Grand River Chemical Div.), Pryor, Okla.
Raw material: Natural gas.
Principal products: Ammonia (180 tons per day), urea, nitrogen solutions.
Personnel: W. W. Yeandle, works manager.

E

ESCAMBIA BAY CHEMICAL CORP., Pensacola, Fla.
Raw material: Natural gas.
Principal products: Ammonia (200 tons per day); ammonium nitrate.
Personnel: Kenneth G. Donald, president.

G

GENERAL PETROLEUM CORP., (see Table 2).

GONZALES CHEMICAL INDUSTRIES, INC., Guanica, Puerto Rico.
1956-57 Activities: Has under construction a 1,000-bbl.-daily crude-oil unit to produce anhydrous ammonia (42,000 tons), ammonium sulfate (125,000 tons), sulfuric acid (125,000 tons). Capital investment is $13,000,000. Completion is scheduled for November 1956.
Personnel: Luis R. Gonzales, president; W. Standish Miller, vice president charge of operations.

GRACE CHEMICAL CO. (Div. of W. R. Grace & Co.), Woodstock, Tenn.
Raw material: Natural gas.
Principal products: Ammonia (250 tons daily), urea (150 tons daily).
Personnel: W. J. Haude, vice president and general manager; J. G. Carriere, vice president and plant manager.

H

HERCULES POWDER CO., Hercules, Calif.
Raw material: Natural gas.
Principal products: Ammonia (150 tons per day).
Personnel: E. St. P. Bellinger, works manager.

HERCULES POWDER CO., Louisiana, Mo.
Raw material: Natural gas.
Principal products: Ammonia (115 tons per day); government facility leased and operated by Hercules.
Personnel: J. B. Talley, works manager.

M

MISSISSIPPI CHEMICAL CORP., Yazoo City, Miss.
Raw material: Natural gas.
Principal products: Ammonia (290 tons per day); ammonia nitrate.
Personnel: W. B. Dunwidy, general operations manager; J. M. Phillips, assistant general operations manager.

MISSISSIPPI RIVER CHEMICAL CO., Crystal City, Mo.
Raw material: Natural gas.
Principal products: Ammonia (200 tons per day), nitric acid (240 tons), ammonium nitrate (280 tons), ammonia solutions.

MONSANTO CHEMICAL CO., Lion Oil Division, El Dorado, Ark.
Raw material: Natural gas.
Principal products: Ammonia (585 tons daily), ammonium nitrate, ammonium sulfate, nitrogen solutions, aqua ammonia.

MONSANTO CHEMICAL CO., Lion Oil Division, Luling, La.
Raw material: Natural gas.
Principal products: Ammonia (400 tons per day), ammonium nitrate. Solid (dry ice) and liquid CO_2 (42 tons per day).

N

NATIONAL DISTILLER'S PRODUCTS CORP., Tuscola, Ill.
Raw materials: Byproducts hydrogen from ethylene unit.
Principal products: Ammonia (165 tons per day); ammonium nitrate, nitrogen solution.

NORTHERN CHEMICALS INDUSTRIES, Searsport, Me.
Raw material: Bunker C fuel oil.
Principal products: Ammonia (125 tons per day), nitrogen solutions.

Personnel: F. L. Litty, vice president and general manager; J. Moymhan, assistant general manager.
1956-57 Activities: Plant due on stream 1956; uses Texaco partial oxidation process.

O

OLIN-MATHIESON CHEMICAL CORP., Lake Charles, La.
Raw materials: Natural gas.
Principal products: Ammonia (250 tons per day); hydrazine.

P

PHILLIPS CHEMICAL CO. (subsidiary Phillips Petroleum Co.), Pasadena, Tex.
Raw material: Natural gas.
Principal products: Anhydrous ammonia (450 tons per day), ammonium sulfate.
Personnel: Paul Endacott, president; R. G. Rhodes, plant superintendent.

PHILLIPS CHEMICAL CO., Etter, Tex.
(Government facility leased and operated by Phillips.)
Raw material: Natural gas.
Principal product: Anhydrous ammonia (500 tons per day).
Raw material: Ammonia.
Principal products: Ammonium nitrate, nitrogen solutions, nitric acid.
Personnel: C. W. Forman, plant superintendent.

PHILLIPS PACIFIC CHEMICAL CO., Kennewick, Wash.
(Company formed by Phillips Petroleum Co. and Pacific Northwest Pipeline Corp. Phillips Chemical Co. will operate the plant.)
1956-57 Activities: Has under construction facilities to produce anhydrous ammonia from natural gas (200 tons per day).

S

SAN JACINTO CHEMICAL CO. (A division of Smith-Douglas Co., Inc.), Houston, Tex.
Ray material: Hydrogen.
Principal products: Ammonia anhydrous and aqueous (40,000 tons yearly, high-analysis fertilizers (20,000 tons yearly.)
1956-57 Activities: Fertilizer manufacturing and storage facilities are under way. Capital investment is $135,000. Completion scheduled for October 1956.
Personnel: R. F. Hopkins, president; S. M. Pamplin, production superintendent.

SHELL CHEMICAL CORP., Ventura, Calif.
Raw material: Natural gas.
Principal product: Ammonia (150 tons per day).
1956-57 Activities: Adding urea facilities (100 tons per day), to be completed fall 1956.
Personnel: F. S. Kuenzly, plant manager.

SHELL CHEMICAL CORP., Shell Point (Pittsburg) Calif.
Raw material: Natural gas.
Principal products: Ammonia, ammonium sulfate (steam-methane reforming supplemented by use of hydrogen-rich gas from Shell Oil Co.'s Martinez, Calif., cat reformer).
Principal product: Carbon black.
Personnel: E. S. Bodine, plant manager.

SOHIO CHEMICAL CO. (See Standard Oil Co. of Ohio.)

SOUTHERN NITROGEN CO., INC., Savannah, Ga.
1956-57 Activities: Building ammonia plant to produce anhydrous ammonia, nitrogen solutions, prilled ammonia nitrate, and urea. Capacity will be 257 tons per day. Estimated capital investment for all facilities is $14,000,000. Completion is scheduled for February 1, 1957.
Personnel: John R. Riley, president.

SPENCER CHEMICAL CO., Pittsburg, Kans.
Raw materials: Natural gas (hydrogen and carbon monoxide).
Principal products: Methanol, ammonia, nitric acid, aqua ammonia, ammoniating solutions, ammonium nitrate, dry ice. Capacity 500 tons daily.
Personnel: Kenneth A. Spencer, president; V. F. Hobart, works manager.

SPENCER CHEMICAL CO., Calumet City, Ill.
Raw materials: Methanol and ammonia.
Principal products: Formaldehyde and hexamine (hexamethylenetetramine), aqua ammonia.
1956-57 Activities: Expanding formaldehyde capacity. Completion scheduled for January 1957.
Personnel: R. W. McKinney, works manager.

SPENCER CHEMICAL CO., Henderson, Ky.
Raw material: Natural gas.
Principal products: Ammonia, nitric acid, ammonia solutions, aqua ammonia. Capacity 200 tons per day.
Personnel: R. D. Wallace, works manager.

SPENCER CHEMICAL CO., Vicksburg, Miss.
Raw material: Natural gas.
Principal products: Ammonia, nitric acid, ammonia solutions. Capacity 200 tons per day.
Personnel: W. A. Johnston, works manager.

STANDARD OIL CO. (OHIO), Lima, Ohio.
Raw material: Natural gas.
Principal products: Ammonia (300 tons per day), nitric acid, urea (120 tons per day), ammonium nitrate, nitrogen solutions, dry ice.
Personnel: C. T. Foster, president; S. R. Bolles, manager.

ST. PAUL AMMONIA PRODUCTS CO., Pine Bend, Minn.
Raw material: Natural gas (alternate residual fuel oil during interruptible periods).
Principal products: Ammonia, ammonium nitrate solutions. Capacity 200 tons per day.
1956-57 Activities: Financing completed, $16,000,000.

SUN OIL CO., Marcus Hook, Pa.
Principal product: Ammonia (300 tons per day).
Personnel: W. T. Ashew, manager.

T

TENNESSEE VALLEY AUTHORITY, Wilson Dam, Ala.
(Noncommercial plant owned and operated by the Government).
Raw material: Natural gas.
Principal product: Ammonia (250 tons per day).

THE TEXAS CO., Lockport, Ill.
1956-57 Activities: Will construct, beginning fall 1956, an ammonia plant with capacity of 180 tons per day. Estimated completion late 1957.

U

UNION OIL CO. OF CALIFORNIA.
(See Brea Chemical Co.; also Table I).

Projects That Have Been Under Consideration

(Hydrogen from Natural Gas)

Ammonia Chemical Corp. of California at Oleander, Calif.; Columbia River Chemicals, Inc., at Pasco, Wash.; Salt Lake Chemical, at Salt Lake City, Utah; Simpson Coal & Chemical near Natchez, Miss., 160 tons per day as part of natural gas-acetylene plant making also vinyl chloride monomer and polymer; Southwest Agrochemical in Arizona; Thunderbird Corp. in Arizona; Utah Chemical Co. at Mount Pleasant, Utah; United Chemical Co. at Timpson, Tex., Grover Hart, president.

Other Ammonia Plants (hydrogen from coke water gas)

E. I. du Pont de Nemours & Co. at Belle, W. Va. (over 750 tons per day, now converting to Texaco partial oxidation method; not certain whether based in part on natural gas); Ketona Chemical Co. (Hercules and Alabama Byproducts) at Ketona, Ala., 125 tons per day; Olin-Mathieson Corp. at Morgantown, W. Va., 570 tons per day (reported converting to coal gasification-partial oxidation); U. S. Steel at Geneva, Utah, 200 tons per day.

Other Ammonia Plants (hydrogen from chlorine cells)

Columbia-Southern Chemical Co. at Natrium, W. Va., 75 tons per day; Dow Chemical Co. at Pittsburg, Calif., 20 tons per day; Dow Chemical Co. at Freeport, Tex., 230 tons per day; Dow Chemical Co. at Midland, Mich., 100 tons per day; E. I. du Pont de Nemours & Co., Inc., at Niagara Falls, N. Y., 30 tons per day; Hooker Electrochemical Co. at Tacoma, Wash., 60 tons per day; Olin-Mathieson Corp. at Lake Charles, La., 60 tons per day; Olin-Mathieson Corp. at Niagara Falls, N. Y., 20 tons per day; Pennsylvania Salt Co. at Wyandotte, Mich., 95 tons per day; Pennsylvania Salt Co. at Portland, Ore., 20 tons per day; Westvaco Chlor-Alkali Div., (Food Machinery & Chemical Corp.) at Charleston, W. Va., 60 tons per day.

TABLE 3—BUTADIENE AND COPOLYMER PLANTS

(Additional companies making N-type of rubbers and other elastometers listed in Table 2).

COPLYMER (GR-S) PLANTS

AMERICAN SYNTHETIC RUBBER CORP., Louisville, Ky.
Capacity: 44,000 long tons per year.
1956-57 Activities: New combined capacity 68,500 long tons per year. Added capital investment $3,000,000. Completion early 1957.

COPOLYMER CORP., Baton Rouge, La.
Capacity: 54,500 long tons per year.
Personnel: C. M. Hulings, operating vice president; T. B. Crowell, production manager.
1956-57 Activities: Thirty per cent expansion of all plant facilities started. (Second expansion.)

FIRESTONE TIRE & RUBBER CO., Akron, Ohio.
Capacity: 40,000 long tons per year.

FIRESTONE TIRE & RUBBER CO., Lake Charles, La.
Capacity: 150,000 long tons per year.
1956-57 Activities: Second expansion since purchase of plant from Government to boost capacity to 190,000 long tons per year; completion end 1956.

GOODRICH-GULF CHEMICAL, INC., Port Neches, Tex.
Capacity: 90,000 long tons per year.
Personnel: W. R. Bateman, plant manager.
1956-57 Activities: To be expanded as butadiene capacity at adjoining butadiene plant is expanded.

GOODRICH-GULF CHEMICAL, INC., Institute, W. Va.
Capacity 122,000 long tons per year.
1956-57 Activities: Plans 4-year expansion and modernization program.

GOODYEAR SYNTHETIC RUBBER CORP., Akron, Ohio.
Capacity: 15,200 long tons per year.
Personnel: E. J. Thomas, president; R. C. Stell, plant manager.

GOODYEAR SYNTHETIC RUBBER CORP., Houston, Tex.
Capacity: 137,500 long tons per year.
Personnel: B. A. Rosinski, plant manager.
1956-57 Activities: Expanding capacity to 170,000 long tons per year, at cost of $6,000,000; completion early 1957.

NAUGATUCK CHEMICAL CO., Naugatuck, Conn.
Capacity: 22,000 long tons per year (last official government figure on plant before purchase by Naugatuck).
Personnel: J. E. Caskey, vice president and general manager; F. D. Chittenden, production manager.

PHILLIPS CHEMICAL CO., Borger, Tex.
Capacity: 63,000 long tons per year.
Personnel: G. H. Short, plant manager; H. D. Trotter, assistant plant manager.
1956-57 Activities: Being expanded to 108,000 long tons per year; completion 1956.

SHELL CHEMICAL CORP., Torrance, Calif.
Capacity: 89,000 long tons per year; styrene, 62,500 tons per year.
Personnel: M. Voogd, plant manager; G. S. Williamson, plant superintendent.
1956-57 Activities: Increasing plant capacity to 110,000 long tons per year. Extending range of rubber types manufactured.

TEXAS-U. S. CHEMICAL CO., Port Neches, Tex.
Capacity: 112,000 long tons per year.
Personnel: W. P. Gee, president; T. A. McCoy, manager.
1956-57 Activities: To be expanded as butadiene capacity at adjoining butadiene plant is expanded.

UNITED CARBON CO., Baytown, Tex.
Capacity: 44,000 long tons per year.
Personnel: Oscar Nelson, Jr., president.

UNITED STATES RUBBER CO., (see Naugatuck Chemical).

BUTYL RUBBER (GR-I) PLANTS

ESSO STANDARD OIL CO., Baton Rouge, La.
Capacity: 47,000 long tons per year.
Personnel: C. C. Garvin, Jr., manager chemical production division; J. R. Vanny, assistant manager chemical production division.

HUMBLE OIL & REFINING CO., Baytown, Tex.
Capacity: 44,500 long tons per year.
Personnel: Hines Baker, president; G. L. Farned, plant manager; James Harrop, general superintendent.

BUTADIENE PLANTS—PETROLEUM

CARBIDE & CARBON CHEMICALS CORP., South Charleston, W. Va.
Personnel: F. H. Beldon, general superintendent.

CARBIDE & CARBON CHEMICALS CORP., Texas City, Tex.
Personnel: T. W. Wilker, superintendent.

COPOLYMER CORP., Baton Rouge, La.
Capacity: 30,000 tons per year.
Personnel: C. M. Hulings, operations vice president; T. B. Cravell, production manager.
1956-57 Activities: Thirty per cent expansion started.

DOW CHEMICAL CO., Midland, Mich.
Personnel: Dr. Leland I. Dean, president; L. O. Richards, director of engineering.

ESSO STANDARD OIL CO., Baton Rouge, La.
Personnel: C. C. Garvin, Jr., manager chemical production division; J. R. Vannoy, assistant manager chemical production division.

FIRESTONE TIRE & RUBBER CO., Orange, Tex.
Building new 40,000-ton per year plant for completion early 1957. Also building 75,000-ton per year styrene plant.

FOOD MACHINERY & CHEMICAL CORP., Houston, Tex.
Capacity: 90,000 tons per year.

GOODRICH-GULF, TEXAS-U. S. CHEMICAL, Port Neches, Tex.
Capacity: 190,000 tons per year.
Personnel: W. R. Bateman, plant manager.
1956-57 Activities: Capacity being expanded to 300,000 tons per year. Full production from expanded facilities scheduled for fall of 1958. Some of the increased output will be realized in late 1957.

HUMBLE OIL & REFINING CO., Baytown, Tex.
Capacity: 49,000 tons per year.
Personnel: G. L. Farned, plant manager; James Harrop, general superintendent.
1956-57 Activities: Expanding butadiene capacity by 16,000 tons per year. Completion first quarter 1957.

ODESSA BUTADIENE CO., Odessa, Tex.
(Formed by El Paso Natural Gas Co., Odessa Natural Gas Co., United Carbon Co., and General Tire & Rubber).
1956-57 Activities: Building 50,000 tons per year plant at cost of $20,000,000. Completion mid-1957.

PETROLEUM CHEMICALS, INC., Lake Charles, La.
Capacity: 63,000 tons per year.
Personnel: Bruce K. Brous, president; F. M. Simpson, vice president.
1956-57 Activities: Expanding by 16,000 tons year year at cost of $4,500,000; completion 1956.

PETRO-TEX CHEMICAL CORP., Houston, Tex.
Capacity: 90,000 tons per year.
Personnel: J. R. Mares, managing director; G. A. Cain, vice president; R. V. Mertz, vice president.
1956-57 Activities: Increasing to 135,000 tons per year. Completion late 1956.

PHILLIPS CHEMICAL CO., Borger, Tex.
Capacity: 74,000 tons per year.
Personnel: G. H. Short, plant manager.
1956-57 Activities: Being expanded by 24,000 tons per year.

SHELL CHEMICAL CORP., Torrance, Calif.
Capacity: 48,000 tons per year.

Personnel: M. Voogd, plant manager; G. S. Williamson, plant superintendent.
1956-57 Activities: Enlarging butadiene capacity.

STANDARD OIL CO. OF CALIFORNIA, El Segundo, Calif.
Capacity: 50,000 tons per year equivalent butadiene (crude butadiene and butylene).

TEXAS BUTADIENE & CHEMICAL CORP., Houston, Tex.
Personnel: E. L. Green, Jr., president; K. D. Bowen, vice president and general manager.
1956-57 Activities: Plant under construction, completion late 1956 or early 1957. Capacity 65,000 tons per year of butadiene.

TABLE 4 — U. S. SULFUR-CONVERSION PLANTS

FROM SOUR NATURAL GAS

COLUMBIAN CARBON CO., Seminole, Tex.
Raw material: Sour natural gas.
Principal product: Sulfur, 15.4 tons per day; carbon black (channel process), 37.5 tons per day.
Personnel: Carl E. Kayser, president.

CONTINENTAL SULPHUR & PHOSPHATE CORP., Thermopolis, Wyo.

GULF OIL CORP., Crane County, Tex.
Raw material: Natural gas.
Principal product: Sulfur (20 tons daily).
Personnel: R. C. Faulkner, general superintendent Texas refineries.

IMPERIAL SULFUR & ACID CO., Fruitland (near Farmington, N. M.)
Personnel: D. C. Cornell III, superintendent.

JEFFERSON LAKE SULFUR CO., Needville (Fort Bend County), Tex.
Personnel: H. Walet, Jr., president; P. J. Kern, field superintendent; L. F. Zeller, power plant superintendent.

MONSANTO CHEMICAL CO., Lion Oil Div., Magnolia, Ark.

MONTANA SULFUR & CHEMICAL CO., East Billings, Mont.
Plant capacity: 40 tons per day.
Personnel: D. G. Zink, president.

OLIN-MATHIESON CHEMICAL CO., Magnolia, Ark.
Raw material: Sour natural gas.
Principal product: Sulfur.

OLIN-MATHIESON CHEMICAL CO., McKamie, Ark.
Raw material: Sour natural gas.
Principal product: Sulfur.

PHILLIPS CHEMICAL CO., Crane County, Texas.

PHILLIPS CHEMICAL CO., Goldsmith, Tex.

RICHARDSON GASOLINE CO., SID, Kermit, Tex.
Raw material: Hydrogen sulfide.
Principal product: Sulfur, 10 tons per day.
Personnel: W. F. Matheny, vice president and general manager; D. H. Huff, superintendent.

RICHARDSON, SID, Odessa, Tex.
Principal product: Sulfur, 20 tons per day.

SEABOARD OIL CO., Silvertip, Wyo.
Raw material: Sour natural gas.
Principal products: Sulfur, 60 long tons per day.
Personnel: J. A. Tiehen, division processing engineer; W. R. Strong, plant foreman.

STANOLIND OIL & GAS CO., Midland Farms, Tex.
1956-57 Activities: Building sulfur plant with capacity of 11 tons per day. Completion set for October 1, 1956.

STANOLIND OIL & GAS CO., North Cowden (Odessa), Tex.
Raw material: Sour natural gas.
Principal product: Sulfur (17 tons per day).

STANOLIND OIL & GAS CO., Sundown, Tex.
Raw material: Sour natural gas.
Principal products: Sulfur (42 tons per day).

STANOLIND OIL & GAS CO., Elk Basin, Wyo.
Raw material: Sour natural gas.
Principal products: Sulfur (65 tons per day).

TEXAS GULF SULPHUR CO., Worland, Wyo.

WARREN PETROLEUM CORP., Monument, N. M.
Personnel: L. A. Walker, superintendent.

FROM REFINERY GAS

ALLIED CHEMICAL & DYE CORP., General Chemical Div., El Segundo, Calif.
Raw material: Refinery gases.
Principal product: Sulfuric acid.
Personnel: J. V. Claes, superintendent.

ALLIED CHEMICAL & DYE CORP., Richmond, Calif.
Raw material: Refinery gases.
Principal product: Sulfuric acid.
Personnel: D. L. Hicken, superintendent.

ATLANTIC REFINING CO., Philadelphia.

CITIES SERVICE REFINING CORP., Lake Charles, La.
Raw material: Refinery gases.
Principal products: Sulfur, 20 tons per day capacity.
Personnel: J. D. Harlan, process superintendent.

CONSOLIDATED CHEMICAL INDUSTRIES, INC., Baton Rouge, La., Baytown, Tex.

FREEPORT SULPHUR CO., Westville, N. J.
Raw material: Refinery gases.
Principal product: Sulfur, 30 tons per day.
Personnel: Langbourne M. Williams, president; E. F. Fay, plant manager.

GENERAL PETROLEUM CORP., Torrance, Calif.
Principal product: Hydrogen sufide in commercial amine solution.

GULF OIL CORP., Port Arthur, Tex.
Principal product: Sulfur, 60 tons per day.

GULF OIL CORP., Philadelphia.
Raw material: Refinery gases.
Principal product: Sulfur, 130 tons daily.
Personnel: J. O. Timms, general superintendent.

HANCOCK CHEMICAL CO., Watson, Calif.
Raw material: Hydrogen sulfide.
Principal product: Sulfur, 200 tons per day.
Personnel: John W. Hancock, president.

HANCOCK OIL CO., Signal Hill, Calif.
Raw material: Hydrogen sulfide.
Principal product: Sulfur, 10 tons per day.
Personnel: A. E. Williamson, operating superintendent.

PURE OIL CO., Lemont, Ill.
Raw material: Liquid fractions.
Principal products: Solvents, cresylic acid.
Raw material: Refinery gases.
Principal product: Sulfur.
Personnel: Robert L. Milligan, president; J. K. Lawson, manager.

SHAMROCK OIL & GAS CORP., Sunray, Tex.
Raw material: Refinery gases.
Principal product: Sulfur (30 long tons per day).
Personnel: J. H. Dunn, president; A. V. Beckworth, superintendent.

SHELL CHEMICAL CORP., Deer Park, Tex.
Personnel: R. C. McCurdy, president; G. Purcell, plant manager.

SINCLAIR REFINING CO., Houston, Tex.
Principal product: Sulfur, 30 tons per day.
Personnel: J. D. Seifer, plant manager.

STANDARD OIL CO. (IND)., Whiting, Ind.
Raw material: Refinery gases.

Principal product: Sulfur, 55 tons per day capacity.
Personnel: F. O. Prior, president; A. F. Endres, manager.

SUN OIL CO., Marcus Hook, Pa.
Personnel: W. T. Askew, manager.

THE TEXAS CO., Port Arthur, Tex.

UNION OIL CO. OF CALIFORNIA, Oleum, Calif.
Raw materials: Refinery gases and wastes.
Principal products: Sulfur (18,250 tons yearly; capital investment $600,000).
Personnel: M. S. Thomson, plant manager.

WILSHIRE OIL CO. OF CALIFORNIA, Norwalk, Calif.
Raw material: Refinery gases.
Principal product: Sulfur (capacity is 12 tons per day, but plant producing only 6½ tons per day).
Personnel: C. E. Sellen, general refinery superintendent.

TABLE 5 — U. S. CARBON-BLACK PLANTS

FURNACE PROCESS

CABOT CARBON CO., Guymon, Okla.; Ville Platte, La.; Pampa, Tex. Gas throughput 13,000,000 cu. ft. per day.

COLUMBIAN CARBON CO., Conroe, Tex.
Principal product: Carbon black (furnace process), 87.5 tons per day.
Personnel: Clyde C. May, supervisor.

COLUMBIAN CARBON CO., Seagraves, Tex.
Principal products: Carbon black (furnace process), 76 tons per day.
Personnel: J. E. Earhart, supervisor.

COLUMBIAN CARBON CO., Eola, La.
Principal product: Carbon black (furnace process), 63.2 tons per day.
Personnel: R. H. Cobb, supervisor.

COLUMBIAN CARBON CO., Hancock, La.
Principal product: Carbon black (furnace process).

COLUMBIAN CARBON CO., Hickok, Kans.
Principal product: Carbon black (furnace process), 43.3 tons per day.

COLUMBIAN CARBON CO., El Dorado, Ark.
Principal product: Carbon black (furnace process), 87.5 tons per day.
Personnel: Kenneth Barnes, supervisor.

COLUMBIAN CARBON CO., North Bend, La.
Principal product: Carbon black (furnace process), 65.6 tons per day.
1956-57 Activities: Planning 20,000,000-lb. per year expansion.

CONTINENTAL BLACKS, INC., Ponca City, Okla.
Principal product: Carbon black (furnace process). Capacity 30,000,000 lb. per year.
Personnel: R. I. Wishnick, president; F. Forbes, manager production.

CONTINENTAL BLACKS, INC., Westlake, La.
Principal product: Carbon black (furnace process).
Personnel: Wayne Fergus, manager production.

CONTINENTAL CARBON CO., Sunray, Tex.
17,000,000 cu. ft. per day gas throughput.

CONTINENTAL CARBON CO., Eunice, N. M.
New 25,000,000-lb. per year S.R.F. plant using natural gas.

CONTINENTAL OIL BLACK CO., Westlake, La.

HUBER CORP., J. M., Baytown, Tex.
Principal product: Carbon black (furnace process), 110 tons daily.
Personnel: H. W. Huber, president.

HUBER CORP., J. M., Borger, Tex.
Principal product: Carbon black (furnace process), 90 tons daily.
Principal product: Carbon black (channel process), 74 tons daily.
Personnel: George Green, plant superintendent.

PHILLIPS CHEMICAL CO., Borger, Tex.
Raw materials: Gas oil.
Principal product: Carbon black.
1956-57 Activities: Expanding butane facilities to produce carbon black, butadiene, and butylene; 74,000 short tons annual capacity. Expanding butadiene facilities to produce copolymer; 63,000 long tons annual cap.
Personnel: H. E. Halton, plant superintendent.

SHELL CHEMICAL CORP., Shell Point, Calif.

THERMATOMIC CARBON CO., Sterlington, La.

UNITED CARBON CO., Aransas Pass, Tex.; Shamrock, Tex.; Ryan, Kans.

CHANNEL PROCESS

BARNHART HYDROCARBON CORP., Big Lake, Tex.

CABOT CARBON CO., Skellytown, Tex; Pampa, Tex. (50,000,000 cu. ft. per day throughput); Kermit, Tex. (40,000,000 cu. ft. per day throughput); Hobbs, N. M.

CARBON BLACKS, INC., Rayville, La.
Raw material: Carbon black.
Principal products: Color blacks, carbon blacks.
1956-57 Activities: Construction of 13 new buildings making carbon black. Investment is $115,000. Yearly output is 720,000 lb. of black.
Personnel: J. H. Mann, Jr., president.

COLTEX CORP., Lefors, Tex.
32,000,000 cu. ft. per day gas throughput.

COLUMBIAN CARBON CO., Corpus Christi, Tex.
Principal product: Carbon black (channel process), 15.7 tons per day.
Personnel: J. C. Aulds, supervisor.

COLUMBIAN CARBON CO., Lefors, Tex.
Principal product: Carbon black (channel process), 36.1 tons per day.

COLUMBIAN CARBON CO., Sweeny, Tex.
Principal product: Carbon black (channel process), 1.8 tons per day.

COLUMBIAN CARBON CO., Eunice, N. M.
Principal product: Carbon black (channel process), 34 tons per day.
Personnel: C. E. Thompson, supervisor.

COLUMBIAN CARBON CO., Coltexo, Tex.
Principal product: Carbon black (channel process), 6 tons per day.

CONTINENTAL CARBON CO., Eunice, N. M.
Principal product: Carbon black (channel process).
Personnel: R. I. Wishnick, president.

J. M. HUBER CORP., Borger, Tex.
Capacity: 74 tons per day.

RICHARDSON CARBON CO., SID, Odessa, Tex.
Raw material: Hydrogen sufide.
Principal product: Sulfur, 20 tons per day.
Raw material: Residue gas.
Principal product: Carbon black, 75,000,000 lb. per year.

UNITED CARBON CO., INC., Aransas Pass, Tex. (20,000,000 cu. ft. per day gas throughput); Rayville, La.; Stinnett, Tex. (25,000,000 cu. ft. per day gas throughput).

ROLLER PROCESS

PEERLESS CARBON BLACK CO., Sweeny, Tex. (5,000,000 cu. ft. per day gas throughput); Gray County, Texas (12,000,000 cu. ft. per day gas throughput).

NOTE: The Journal's Survey of Canadian Petrochemical Plants was published in the Canadian Number, August 20, 1956, on pages 218 and 220.

Polyethylene
Liquids extraction—fractionation
Panhandle Eastern station
Power plant
Reservoir—water treating
Ethylene, ethyl alcohol and ethyl chloride
Illinois Farm Supply Co. fertilizer plant
Sulfuric acid, ammonia, alcohol denaturing, future U.S.I. isosebacic acid, and future phosphoric acid

Expanding Facilities at Tuscola—1

DOES IT PAY TO DIVERSIFY?

Here's a three-part article covering recent expansions at the huge Tuscola, Ill., petrochemical facilities of National Petro-Chemical Corp. and its parent company, National Distillers Products Corp. The first section gives a brief review of the over-all growth and tie-in of these facilities. The second section deals with process changes made in the ethylene plant to boost capacity from 300 to 350 tons per day. Third section covers the U.S.I. ammonia plant.

by John C. Reidel
Petrochemical Editor

THE history of the 5-year-old Tuscola, Ill., plant of National Petro-Chemical Corp. is one of constant growth and expansion. Initial ethyl alcohol capacity, amounting to 25 per cent of U. S. total has been substantially expanded.

Several additions were made to the processing facilities last year. In addition to the new alcohol plant, a 26,000,000-lb. per year polyethylene plant and an ammonia plant started operations. Phosphoric acid and isosebacic acid plants are next on the expansion list.

1—EXPANDING FACILITIES

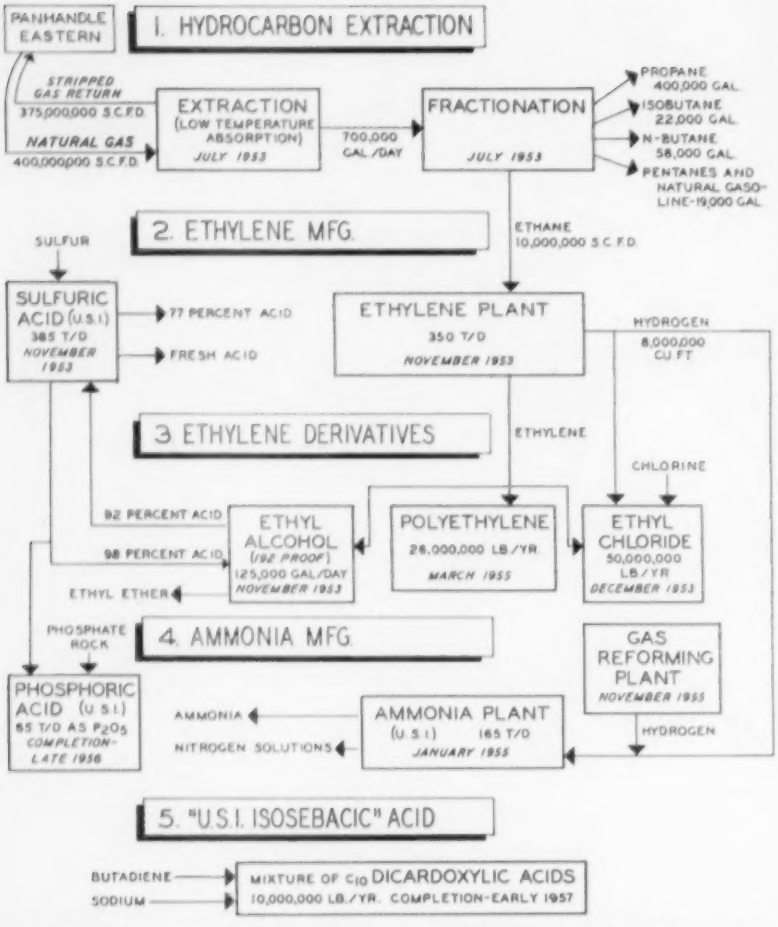
Rapid growth of plants and their relationship is shown in Fig. 1.

Extraction of liquids from the pipeline gas has been covered in earlier articles.[1,2] Operation on a lean pipeline gas necessitates use of low-temperature absorption. Briefly, the extraction section includes a light-oil absorber system operating at low temperatures (in the order of —10° F.) and a heavy-oil absorber system operating at 60° F. Three absorbers in parallel are used in each of these systems. Stripping of the hydrocarbons is accomplished by a demethanizer and light and heavy-oil stills. A fractionation train then separates the extracted liquids into ethane, L.P.G. (propane), normal and isobutane, and pentanes (natural gasoline).

Ethylene is the main building block for the many chemicals produced at Petro. Ethane is cracked at a temperature of 150° F. into ethylene and hydrogen. Both products are then purified by distillation, the hydrogen at temperatures as low as —275° F.

Ethyl alcohol was the key ethylene derivative at Tuscola when the plant originally went into operation. At that time, National Petro-Chemicals alcohol capacity at Tuscola amounted to about 25 per cent of the total U. S. capacity. Ether is produced as a byproduct of the alcohol operation, and this is purified in a series of distillation columns. In late 1955, U. S. Industrial Chemicals Division of National Distillers Products Corp. opened two more alcohol-denaturing plants, one of them at Tuscola. These feature automatic blending controlled from a central point. More recently an anhydrous alcohol unit, described as "probably the largest in the world," has been installed.

Ethyl chloride. Purified hydrogen from the ethylene unit is reacted with chlorine to form hydrogen chloride. This is then reacted with the ethylene



HOW TUSCOLA PLANTS HAVE GROWN . . . This diagram shows tie-in of facilities. Nominal ethylene plant capacity is now 350 tons per day, largest single ethylene unit in operation. Fig. 1.

to produce ethyl chloride, at a nominal production rate of 50,000,000 lb. a year. The chlorine is not produced locally, but U.S.I. makes chlorine at two of its other locations.

Polyethylene. In early 1955 a polyethylene plant went on stream at Petro. This plane polymerizes ethylene to polyethylene by a modified I.C.I. high-pressure process. Originally designed for a 26,000,000-lb. per year capacity, the plant is currently being expanded.

Sulfuric acid in large quantities is used in the synthesis of ethyl alcohol from ethylene. This is manufactured next door at U.S.I.'s sulfuric acid plant. Spent acid from Petro is then returned to U.S.I.

Ammonia is synthesized in an adjoining U.S.I. plant which started up in early 1955, from byproduct hydrogen from Petro's ethylene plant, and nitrogen from the air. A Girdler reforming unit was placed on stream later in the year to provide a supplementary source of hydrogen for the ammonia plant. The ammonia is sold either in its anhydrous form, or as nitrogen fertilizer solutions. These as well as the sulfuric acid and phosphoric acid (to be produced by late 1956) find ready markets among nearby fertilizer manufacturers.

2—NEXT—"U.S.I. Isosebacic" Acid

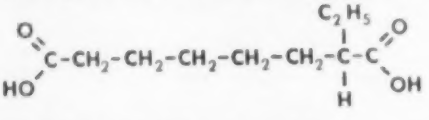
Latest project announced for Tuscola is a plant to make 10,000,000 lb. per year of U.S.I. isosebacic acid. This is a mixture of C_{10} dibasic acids, isomers of sebacic acid. U.S.I. will make it from butadiene and metallic sodium by a process now in pilot plant at U.S.I.'s new research building in Cincinnati. Whether the butadiene will be made at Tuscola has not been announced. The process is reported to use sulfuric acid, and carbon dioxide as well. Both are available locally, the CO_2 from the ammonia-plant reforming unit.

The new product is a competitor of other materials such as sebacic acid which is now commercially made from castor oil. Sebacic acid sells for around 64 cents a pound (several years ago at 80-90 cents a pound). U.S.I. Isosebacic acid is now priced at 45 cents a pound, with a probable reduction in price as commercial production gets under way.

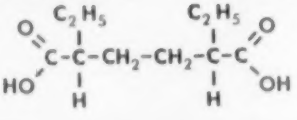
Potential uses of the new petrochemical include: (1) plasticizers; (2) ester-type synthetic lubricants for turbo engines; (3) nylon-type polyamides for molding resins and adhesives; (4) alkyd resins; (5) reinforced plastics; (6) polyurethane resins.

Synthetic lubes. For turbo-jet and turbo-prop engines in high-speed aircraft

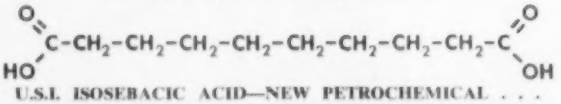
2, ethyl suberic acid 72-80 per cent



2, 5 diethyl adipic acid 12-18 per cent



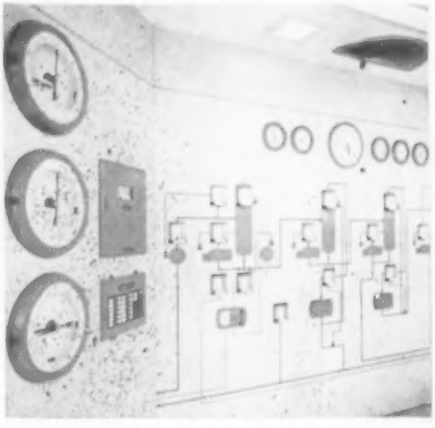
Sebacic acid 6-10 per cent



U.S.I. ISOSEBACIC ACID—NEW PETROCHEMICAL . . . It's a mixture of isomers of sebacic acid. One of its potential uses woud be to make esters for synthetic lubricants used in jet-plane engines.

1 NATURAL GAS comes into the plant from Panhandle Eastern station.

2 HYDROCARBON EXTRACTION is first step in the processing sequence for production of petrochemicals.



3 CONTROL OF FRACTIONATION operations is handled efficiently in this control room.

4 ETHYL ALCOHOL is one of the end petrochemical products to be turned out in the Tuscola plant.

synthetic lubricants are being developed.[3,4] The prototype for these lubes, which must meet stringent military specifications (MIL-L-7808), is an ester of sebacic acid and 2-ethyl hexyl alcohol. Esso Standard's diester lube has been the first approved for military jet-engine use. This is believed to contain di-iso-octyl sebacate and an adipic ester. One producer of adipic acid is Du Pont. This company uses petroleum cyclohexane as starting material.

Esters of azelaic acid (made from tallow) have also been tested in synthetic lubes. As noted, U.S.I. Isosebacic acid will have many other uses. But its potential use for synthetic lube esters is an important one.

3—DOES IT PAY?

How did these extensive petrochemical facilities get built out in the middle of the Illinois cornfields? The answer to this involved the story of a company which diversified.

Only brief highlights can be given here: In 1949, National Distillers Products Corp. formed a wholly owned subsidiary, National Distillers Chemical Co. (since then absorbed into U.S.I. Division) to make metallic sodium and chlorine. The plant making these products is in operation at Ashtabula, Ohio. In 1951, National Distillers merged with U. S. Industrial Chemicals Co. That year was a busy one—Algonquin Chemical Co. was bought (heavy chemicals) and an interest acquired in Intermountain Chemical Co. (Trona mining).

Petrochemicals. Also in 1951, National Petro-Chemical Corp. was formed as a joint venture of National Distillers (60 per cent) and Panhandle Eastern (40 per cent). Building of the Tuscola petrochemical facilities followed. This location was chosen close to the Panhandle Eastern compressor station at the junction of the Panhandle's main line and its subsidiary Trunkline Gas Co. system. Dr. R. E. Hulse, formerly with Du Pont, is in charge of petrochemicals as vice president of National Petro-Chemicals.

The payoff . . . The rapid b u i l d u p of processing facilities at Tuscola indicates the confidence that National's management has in the project, although startup troubles and L.P.G. market conditions did mar the profit picture for 2 long years. In making this large-scale diversification into petrochemicals, heavy expenditures were made over a short period of time. Initial installations at Tuscola were built at a cost of nearly $50,000,000. The U.S.I. sulfuric acid plant cost $2,000,000; the ammonia plant $7,000,000.

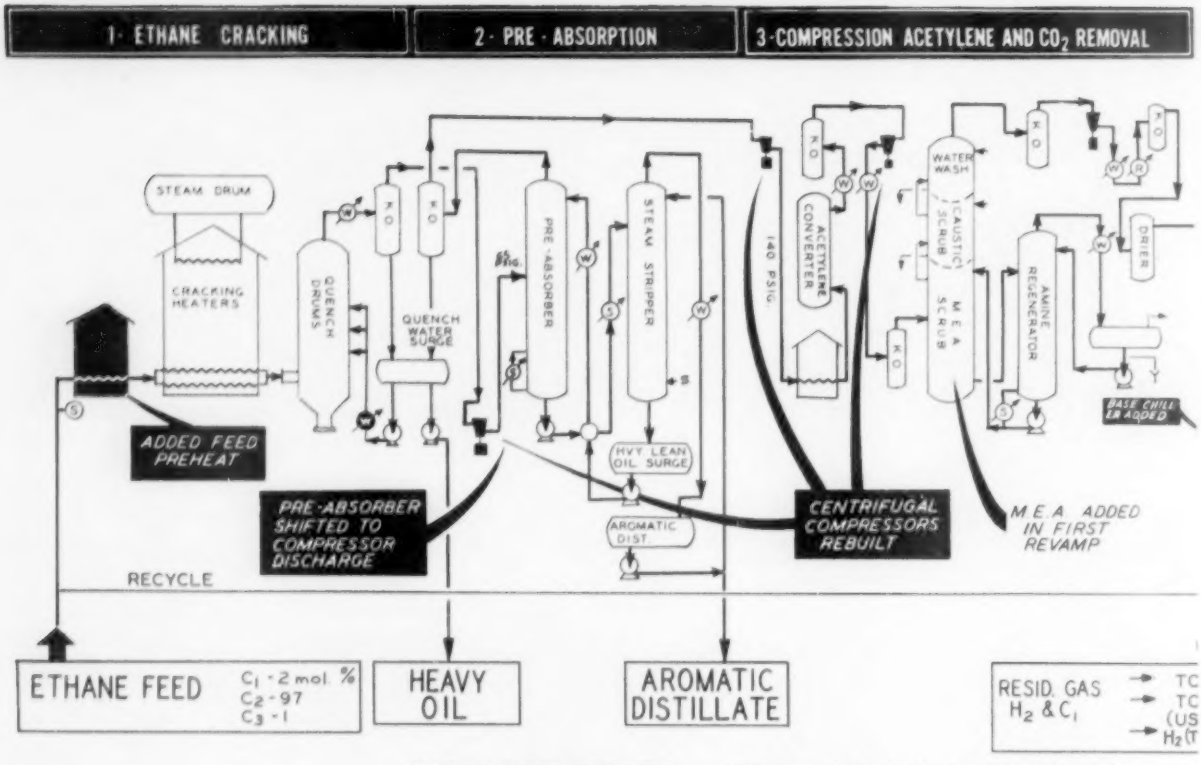
References

1. Stark, The Oil and Gas Journal, June 1, 1953, page 185 (covers liquids extraction and fractionation).

2. The Oil and Gas Journal, November 30, 1953 (discusses hydrocarbon recovery, ethylene, ethyl alcohol, ethyl chloride; also includes section by J. F. McDonald on startup problems and training of operators).

3. Chemical Week, November 27, 1954, (news article on synthetic lubes).

4. The Oil and Gas Journal, March 2, 1953, page 74 (symposium on synthetic lubes from S.A.E. papers).



MAKING MORE ETHYLENE . . . Changes made by National Petro-Chemicals Corp. are indicated. These changes permitted production of high-purity ethylene for polyethylene manu-

Expanding Facilities at Tuscola—2

MORE ETHYLENE . . . AND HOW

Here's a case history of an expansion program

HERE is a case history of ethylene plant revisions made in a large installation to obtain increased capacity. (For more process-design information on ethylene cracking, recovery, and purification, see the articles by H. C. Schutt and S. B. Zdonik appearing currently in The Oil and Gas Journal.)

Ethylene facilities at Tuscola are of particular interest:

1. The plant is located on Panhandle Eastern's pipeline system. It is the largest single ethylene unit in operation.

2. Chemical facilities have been expanded rapidly. Ethylene now goes to polyethylene, ethyl alcohol, and ethyl chloride. Tiein of all the facilities at Tuscola are explained in an article currently appearing in The Oil and Gas Journal.

3. The ethylene plant also furnishes more than 8,000,000 cu. ft. daily of hydrogen to the new 150-ton per day U.S.I. ammonia plant. An article on this plant, including hydrogen purification, appears in this issue of The Oil and Gas Journal.

Ethylene recovery and purification schemes vary from plant to plant depending on composition of feed, final ethylene purity required, economics, and other factors. This discussion, therefore, deals with the modifications made in one particular installation—the large ethylene plant of National Petro-Chemicals Corp. at Tuscola, Ill. Equipment and process changes were such that National Petro-Chem was able to increase ethylene capacity from a nominal 300 to 350 tons per day at a minimum cost.

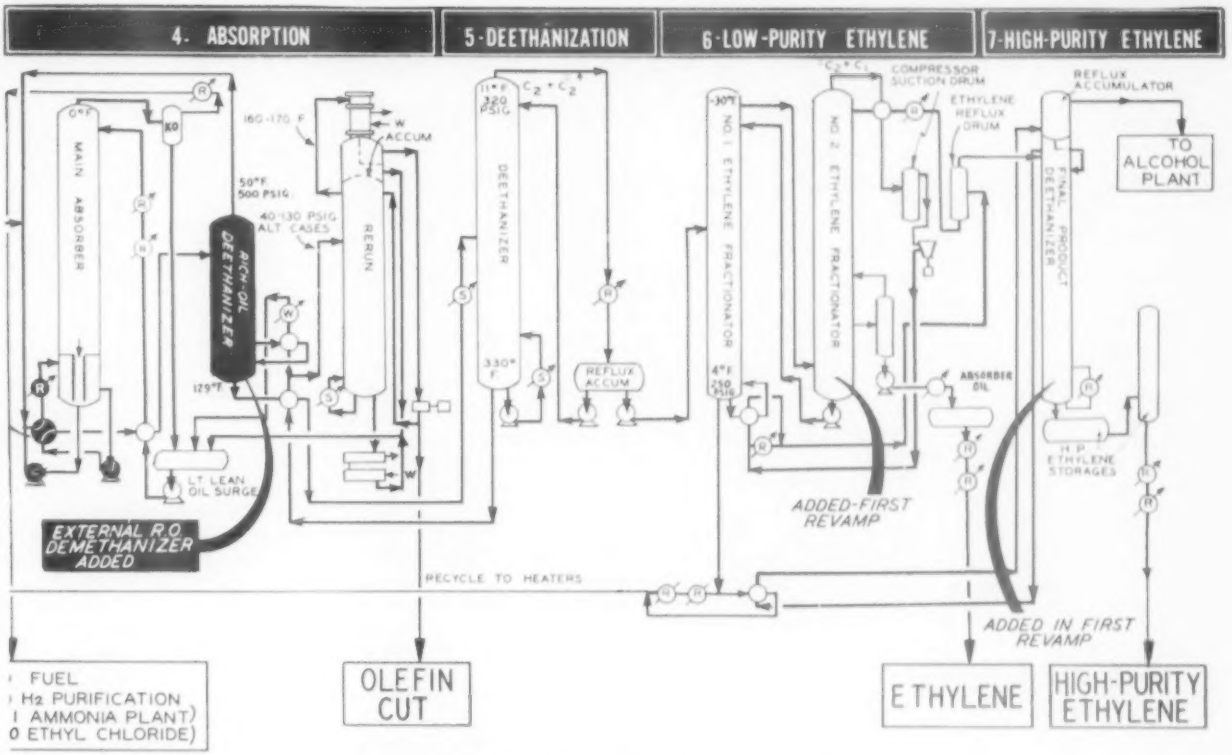
- Facilities for extraction of ethane, propane, butane, and natural gasoline went into operation at Tuscola in late 1953. Process design called for extraction of 40 per cent of the ethane in the gas. Design was based on a peak load of 425 M.M.s.c.f.d. of pipeline gas.

- Ethylene-derivative facilities have grown rapidly at Tuscola. Originally ethylene went to ethyl alcohol and ethyl chloride. More recently a 26,000,000-lb. per year polyethylene plant was built. Over 10,000,000 cu. ft. per day of ethane is now cracked to make ethylene.

- First revamp of ethylene recovery and purification equipment was to provide high-purity ethylene for the polyethylene unit. This was accomplished by adding: (1) an ethanolamine scrubbing unit to remove CO_2, (2) a second ethylene fractionator, and (3) a final-product demethanizer.

Latest revisions were made to obtain the boost in capacity. These included:

PETROCHEMICALS



facture, and increase in nominal ethylene capacity from 300 to 350 tons per day. One of the major changes was revamp of the existing compression system. Fig. 1.

1. Addition of a preheater to take some load off the cracking heaters.
2. Additional quench water cooling capacity.
3. Revamp of the compressor train to obtain ultimate capacity with the existing centrifugal compressors.
4. Relocation of the preabsorber to the first-stage compressor discharge.
5. Addition of absorbing base chiller ahead of the main absorber.
6. Addition of external rich-oil demethanizer to operate in conjunction with the main absorber. Formerly this was run as an absorber-demethanizer combined in one column.

Changing ethylene process scheme . . . Present operation of the ethylene facilities at Tuscola is indicated in Fig. 1. General description of a basic ethylene plant has been given in the literature.[1] The basic ethylene recovery system may consist of:

1. A fractionating absorber which takes out methane and lighter overhead to fuel or other use.
2. Deethanizer which handles the ethane and heavier from the fractionating absorber and in which ethane and ethylene are taken overhead.
3. Ethylene fractionator, a low-temperature tower, which handles the overhead from the deethanizer and makes the separation between ethylene and ethane. Ethylene is taken off overhead as product and ethane bottoms are returned to the heaters as selective cracking feed.

The absorber oil rerun tower might be used to fractionate deethanizer bottoms. A combined cut of propylene and butylene is taken overhead as a byproduct. The stabilized absorber oil leaving the bottoms is returned to circulation.

Original facilities at Tuscola essentially followed along these lines. But the recovery system was different in that a preabsorber was included to handle heater effluent gas; aromatic distillate, taken out in this absorber is then stripped with steam as shown.

For a still different modification of the basic ethylene recovery scheme outlined in this article refers to the description of Canadian Industries, Ltd.'s ethylene facilities at Edmonton, Alta.[2]

At Tuscola, ethane as cracked at approximately 1,500° F. and 2 atm. in a large installation consisting of eight heaters with two coils each. Steam is added to ethane feed, and the mixture is preheated and cracked. Heater effluent is quenched and goes through a set of final water coolers and a knockout drum before entering the first-stage compressor inlet.

Addition of the feed preheater by National Petro-Chemicals removed the bottleneck to expansion of capacity in this section.

Additional throughput imposed an added load to the quenching facilities. This was met by providing more heat exchange and expanding the adjacent cooling tower.

Preabsorber . . . Compressor C-1 operates at 12 psig. suction and 65 psig. discharge pressures. In this preabsorber stage the gas is scrubbed with a petroleum fraction coming from the steam stripper. A steam-heated reboiler is provided for trimming purposes.

In the stripper the byproduct benzene cut (aromatic distillate) is stripped with steam and the stripped oil is used as absorption medium in the preabsorber.

Preabsorber Relocated

Originally the preabsorber was located ahead of the first-stage compressors. This was to take out the benzene cut and accompanying polymer-forming components that might tend to foul the lean oil in the main absorber. This arrangement, however, constituted a bottleneck to capacity increase. The preabsorber was therefore relocated to the first-stage compressor discharge in which position it handles a relatively smaller volume than it did before.

CO_2 removal . . . The gas from the

"Aim of the revamp in the compressor plant was to increase the capacity of this section by 50 per cent. With completion of piping changes, this has been accomplished."

preabsorber is handled by compressor C-2 which discharges it at 140 psig. The gas is then heated in a small direct-fired heater and goes through the acetylene converter. Here acetylene in the gas stream is catalytically hydrogenated with a small portion of the hydrogen formed in cracking. Compressor C-3 discharges the gas at 240 psig. to the monoethanolamine system for removal of CO_2.

This M.E.A. unit operates in a conventional manner. However, the M.E.A. contactor is of stacked design. The cleanup sections (caustic scrub and water wash) are superimposed over the M.E.A. contact section. This results in a more compact arrangement, is easier to operate, and results in equipment savings.

Main Absorber Changes

Following compression in C-4, the stream goes to the main absorber operating at 475 psig. Propane refrigeration (to —15° F.) is employed. Formerly the main absorber column consisted of a lower demethanizing section and upper absorption section combined in one column. The absorber unit was modified by adding an external demethanizer, thus obtaining extra decks for absorption and increased capacity.

These additional trays lighten the load on the final product demethanizer. Again, one of the components of the gas stream (in this case methane) does not have to be carried clear through the process cycle. Another change was addition of a base chiller. This in effect added one more stage of absorption ahead of the main absorber, thus reducing the load on the tower itself.

The absorber offgas, consisting largely of hydrogen with some methane and minor amounts of other constituents, goes to the hydrogen-purification section. A small amount of the hydrogen is used in the National Petro-Chem ethyl chloride plant; the major portion of the 8,000,000 cu. ft. daily goes to the ammonia plant.

Rerun . . . The feed to this tower is some of the stripped absorber oil from the deethanizer. An olefin cut (C_3-C_4) is taken overhead. This small-volume byproduct stream is sold as mixed olefins. The rich oil from the R.O. demethanizer enters the deethanizer. The ethane-ethylene overhead from the deethanizer is condensed by refrigeration and goes to ethylene fractionation.

Ethylene Fractionation

In the present operation the ethylene fractionation section is arranged with two columns in series. The vapors overhead from the first column feed at the bottom of the second, and the overhead from the second (ethylene with a small content of methane) is compressed in C-5 to 530 psig. discharge pressure.

Heat-pump cycle . . . Separation between ethane and ethylene is made in these two columns. Ethylene is condensed in the reboiler of the first column, giving up heat here, and then with the aid of propane refrigeration (—15° F.) furnishes reflux for the No. 2 column. Ethane removed from the bottom of the first column is vaporized and recycled to the preheater.

Purity ethylene . . . The ultimate purification of ethylene is accomplished in the final-product demethanizer. It operates on vapor feed and produces as bottoms ethylene of extremely high purity for the polyethylene plant. The overhead from the final demethanizer may be sent to the alcohol plant or recycled to the main absorber.

Rebuilding compressor train . . . The aim of the revamp in the compressor plant was to increase the capacity of this section by 50 per cent. With the completion recently of piping changes, this has been accomplished.

Rebuilding of the compressor train was conducted by the Carrier Corp., original supplier of the five centrifugals involved. By careful planning this large compressor turnaround was completed within the allotted 10-day period. Optimum use of men and equipment was made by close scheduling.

Labor and materials were figured carefully, even down to the number of paint scrapers required. This was the largest conversion of centrifugal compressors, for providing increased capacity, which Carrier has made to date. It is expected that other such conversions of centrifugal installations will be made.

In the original installation at Tuscola, two compressors were driven by one turbine in tandem drive. To get more horsepower the compressors were split off the tandem drive and turbines were added so that each compressor is driven by its own turbine. This means that each turbine now has some horsepower left over which can be held in reserve for a future expansion. This procedure gave the required expansion in capacity at minimum cost.

Original installation . . . Ethylene plant compressors originally were:

Model—	Horsepower
18VT450 and 18WV450	*3,537
18T350 and 18T350	*3,122
18S350	2,740

*One turbine driving two compressors.

These compressors were part of 12 such units ordered when the plant was built in 1952.

Revamp . . . Purchase of all new machines to provide the required capacity would have been too expensive. The least expensive method, it was decided, was to change impellers and other internals in the existing compressors.

The one new compressor bought had 3,815-hp. rating. Internal parts from the existing five units were used to build new, higher-capacity machines at the job site. Thus, parts from one compressor may have been dispersed among the four compressors which were rebuilt.

Given the horsepower, one can push a lot through a centrifugal case. Hydrostatic pressure ratings for each case were high enough to permit a lower-pressure case to be moved up to the next highest stage. The case of one of the smallest of the five original compressors were scrapped. But some of its internals (diffusers, guide vanes) were used.

Present installation . . . Here are the compressors and horsepower after rebuilding:

Model—	Horsepower — Original	Present
18V500†		†3,815
18WV450 and 18VT450	*3,537	2,655-2,575
18T350 and 18T350‡	*3,122	2,525
18S350	2,740	4,000

*One turbine driving two compressors in original installation. †New compressor. ‡Scrapped.

Acknowledgment

J. W. Nixon is plant manager of National Petro-Chemicals' facilities at Tuscola. G. A. Seigelman is assistant plant manager. Dr. G. E. Montes is chief technologist. Appreciation is expressed in particular to B. J. Anderson, assistant chief technologist, for aid in preparing this article.

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1. Kniel and Slager, Chemical Engineering Progress, Vol. 43, p. 335 (1947) (Monsanto Texas City plant).
2. Jones, Taylor Technology, Summer 1955 issue, Vol. 7, No. 5, p. 11. (Description of Canadian Industries, Ltd., plant.)
3. Nixon, Petroleum Refiner, July 1954, p. 114. (Deals with mined underground storage for propane at Tuscola.)

Expanding Facilities at Tuscola—3

WHY AN AMMONIA PLANT WAS BUILT

Low-temperature processing is key to hydrogen purification

TWO factors led U. S. Industrial Chemicals Co. to consider erection of a 150-ton per day ammonia plant at Tuscola, Ill. One was availability of 8,000,000 cu. ft. per day of byproduct hydrogen from the National Petro-Chemicals Corp. ethylene plant at Tuscola. The other was location in the middle of an agricultural region.

U. S. Industrial Chemicals is a division of National Distillers Products Corp. Panhandle Eastern Pipeline Co. and National Distillers are joint owners of National Petro-Chem. Low-temperature processing units were designed by L'Air Liquide.

In the U.S.I. ammonia plant the hydrogen is purified through a low-temperature cascade system. In this system of exchangers and coolers, C_5's and C_4's, ethane-ethylene, and methane are successively liquefied and separated from the hydrogen. Other impurities, such as CO, small amounts of methane, and traces of CO_2, are removed by liquid-nitrogen wash.

Nitrogen for the wash is obtained from an air-separation unit employing a simple cycle with turboexpanders. Argon is taken as a byproduct from the air-separation cold box, for purification in a separate unit.

Low-temperature processing . . . One of the trends noted in ammonia manufacture is the use of byproduct hydrogen. This could be cat reformer gas from the refinery, coke-oven or other gas. Purification of cat reformer gas has been dealt with.[1,2] Purification of the ethylene-plant byproduct gas at Tuscola is carried out in a similar manner.

Purification of the hydrogen, whatever its source, is a vital step in ammonia manufacture. Duff[3] states that the cost of highly pure hydrogen as required for ammonia synthesis is the most important variable in the economics of ammonia manufacture.

The liquid nitrogen wash process,[4] originally developed in Europe, has become an important technique for hydrogen purification in the United States. Baker notes[5] that approximately 65 per cent of the new ammonia capacity built or contracted since 1951 includes this technique. Merritt[6] has noted that the liquid-nitrogen wash method has proved its worth. He cited the case where an amine scrubber came down, but the nitrogen wash took out the CO_2. A nitrogen-wash exchanger finally become plugged with CO_2, but the CO_2 was prevented from getting on the catalyst. By producing a highly pure hydrogen through nitrogen wash, savings due to extension of catalyst life have been made. A guard converter is no longer necessary where nitrogen wash is employed.

. . . Air-separation plants have become important either to make oxygen for partial oxidation or to produce highly pure (99.99 per cent) nitrogen for the nitrogen wash. The basic principle for low-temperature separation of air is a simple one. But in practice a large variety of cycles have been developed. These have been discussed by Bliss and Dodge[7] and elsewhere.[8]

Van Dyke and Daugherty[9] presented generalized correlations for plant cost and production costs of oxygen, according to capacity. Now with more plants going in that use byproduct hydrogen, it would be useful to have similar generalized charts for hydrogen-purification units. But as Van Dyke and Daugherty point out, wide variation in composition of the hydrogen streams to be processed makes preparation of such generalized correlations difficult.

U.S.I. hydrogen purification . . . Processing at the U.S.I. ammonia plant at Tuscola, Ill., is indicated in the simplified diagram of Fig. 1.

In late 1955, U.S.I. put on stream a reforming unit to produce hydrogen from natural gas. This provides hydrogen supplementary to that obtained from the Petro ethylene plant. It assures operation of the ammonia facilities at full capacity at all times. Though the design capacity of the ammonia plant is 150 tons per day, a higher rate of production is possible and has been achieved.

The hydrogen stream which comes as feed to the hydrogen-purification section contains approximately 80 per cent hydrogen. The remainder consists of hydrocarbons, C_1 through C_5, and smaller amounts of other impurities such as CO. The CO_2 has been removed, except for traces, in the amine scrubbing units of the National Petro-Chem plant and the U.S.I. gas-reforming plant, respectively.

Cascade cycles . . . The hydrogen purification may be thought of as consisting of two heat-exchange cycles and the nitrogen wash. In the main heat-exchanger cycle the feed gas is cooled down by heat transfer countercurrent to the product stream. In an auxiliary cycle liquid N_2 is provided for the nitrogen wash. The nitrogen scrubbing removes the carbon monoxide and methane, and the product gas stream of hyprogen plus nitrogen contains less than 50 p.p.m. impurities. A closed-cycle ethylene refrigeration (compression-expansion) system is provided to aid in chilling the feed gas and liquefying nitrogen.

Cool feed gas down . . . In the main cascade cycle to the left of the nitrogen-wash column (Fig. 1) the feed gas exchanges heat with the product gas and C_5's and C_4's are condensed. These are separated in a knockout drum and sent back through the warm exchange section where they are flashed to provide additional cooling.

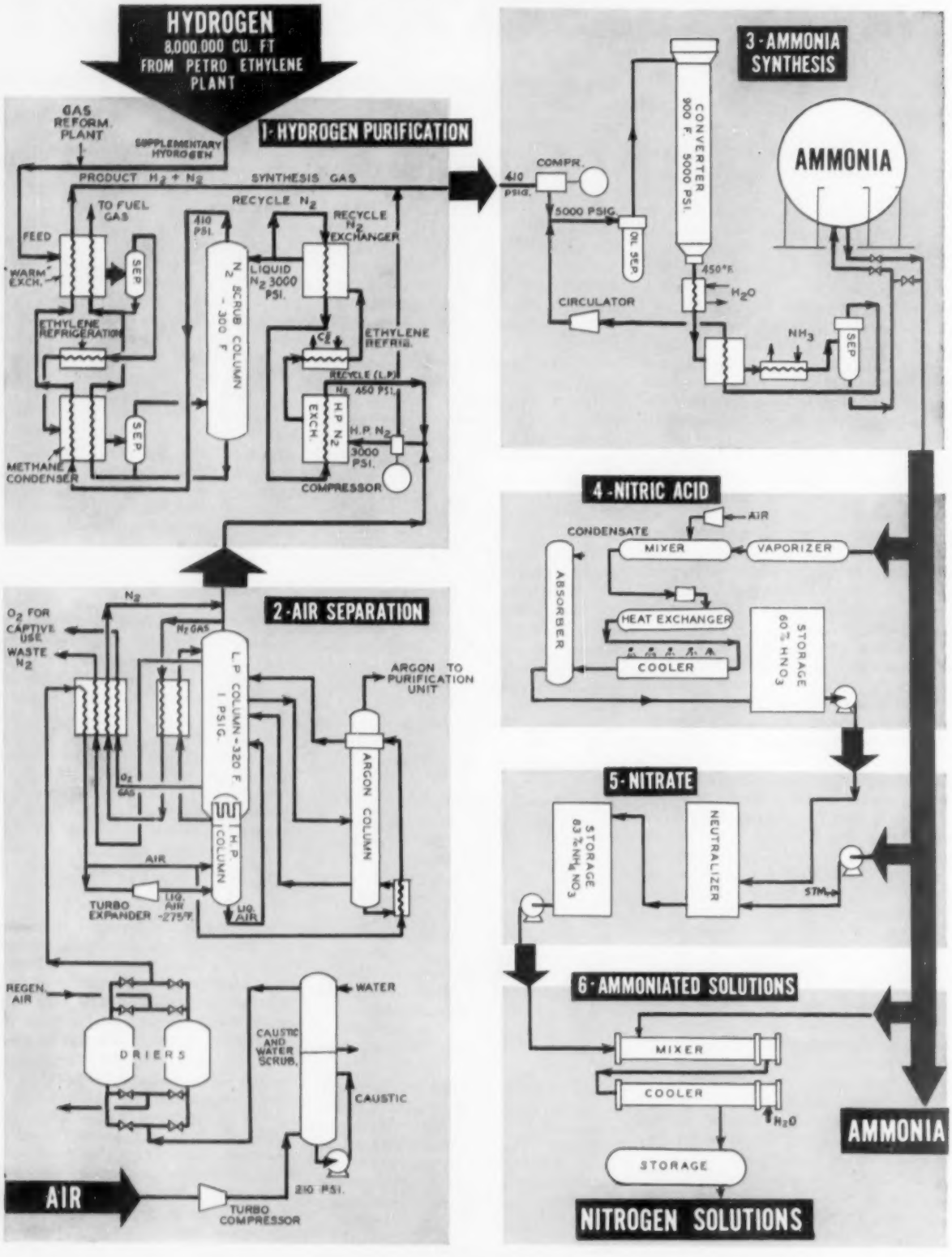
Feed gas is cooled further by evaporation of ethylene in the shell-and-tube cooler and by exchange against cold product gas coming from the top of the nitrogen scrub tower. In this last step of heat exchange, methane, along with some ethane and ethylene, is condensed out.

Nitrogen wash . . . Feed gas now enters the bottom of the nitrogen-scrub column. This vessel is equipped with sieve trays. Product gas leaves overhead from this column at about 410 psig. This product gas consists of the pure hydrogen and about 13 per cent of nitrogen. The remainder of the nitrogen is then added as shown external to the hydrogan-purification cold box.

This product gas is heat exchanged against feed gas, as noted. Liquid nitrogen with some CO_2 from the bottom of the wash column, provides additional cooling by evaporation to help condense methane and heavier from the feed gas.

Liquid-nitrogen cycle . . . Nitrogen gas

Here's how ammonia is made at Tuscola . . .



leaves the top of the L.P. column, in the air-separation cold box at a pressure slightly above atmospheric. A portion of the nitrogen is taken to the hydrogen-purification section and is compressed in two reciprocating compressors to 3,000 psi. This high-pressure nitrogen is cooled by heat exchange against expanding low-pressure (15 psig.) hydrocarbon stream and recycle nitrogen. It is further cooled by ethylene refrigeration and by evaporation of nitrogen in the recycle exchanger. Through these successive stages the nitrogen is liquefied, and then enters the nitrogen wash tower.

Air-separation unit . . . Air is handled by a 2,600-hp. centrifugal compressor, operating at 9,000-11,000 r.p.m., with capacity of 7,200 cu. ft. per minute. Air at 210 psi. is scrubbed with caustic to remove CO_2, goes through an ammonia cooler and knockout drum (not shown) and through activated alumina dehydration from which it comes at a dew point not less than —70° to —80° F. It then enters the cold box.

Air-separation cold box . . . The air goes through a system of heat exchangers in which it is cooled down by exchanging heat with the separated products, oxygen and nitrogen. Additional refrigeration is obtained through expansion of a portion of the air in turbo expanders.

The air, now at about —275° F., is fed as a liquid to the air-fractionation column. This is a double column where separation is made into 99.99 per cent pure nitrogen and 99.0 per cent oxygen. Liquid nitrogen from the top of the H.P. column is used to reflux the L.P. column. Liquid air (rich air containing 30-35 per cent oxygen) is withdrawn as bottoms from the H.P. column and provides the feed to the L.P. column.

The central section between the lower and upper columns acts as a condensing section for the vapor at the top of the H.P. column and as a vaporizer or reboiler section for the liquid in the bottom of the L.P. column.

Air is fed to H.P. column both as gas and liquid, as indicated. In the H.P. column air rises from tray to tray with liquid nitrogen flowing down. Transfer of cold from the liquid nitrogen liquefies all the oxygen and part of the nitrogen in the air. That part of the nitrogen not liquefied rises to the top of the H.P. column where it is condensed and a portion withdrawn for refluxing the L.P. column. Withdrawal of some of the nitrogen here results in a rich air bottoms in the H.P. column.

As liquid air from the bottom of the H.P. column is fed into the L.P. column some nitrogen flashes. This vapor rises through the L.P. column together with nitrogen vaporized at the bottom and intermediate points of this column. The nitrogen gas leaving the top of the L.P. column passes back through heat exchange in the air-separation cold box and goes to the hydrogen-purification section to the liquid nitrogen cascade system. Excess flow, above that used for plant instrument air, is vented to the atmosphere. A takeoff from third stage of N_2 compression is then added downstream of the hydrogen-purification section to make the slightly higher than 3:1 ratio of hydrogen to nitrogen required for ammonia synthesis.

There is a small waste stream of impure N_2 withdrawn. The oxygen stream is withdrawn as a gas, goes through the air-separation heat-exchange system and is presently being vented. However, internal uses are being developed for the oxygen. It is intended to use some of it in the nitric acid section.

Argon Byproduct

An argon-rich sidestream is taken from the L.P. column and is partially purified in a small argon column. The raw argon stream is then piped to a separate unit for final purification. This argon stream is a relatively small-volume stream. But it is interesting to see it being made as a byproduct in an ammonia plant. Argon is gaining in importance as an industrial gas with a present United States capacity of over 500 million cubic feet per year. Its most important use is for inert-gas shielding in electric-arc welding. It has other uses in incandescent lamps and electronic tubes. U.S.I. makes argon-grade metallic sodium at its Ashtabula, Ohio, plant. This is produced and packed in an atmosphere of argon gas.

Ammonia synthesis . . . Design capacity of the ammonia plant is 150 tons per day. Synthesis gas is taken by two Cooper-Bessemer compressors and brought up in stages from 400 psi. to the synthesis pressure of about 5,000 psi. Fresh synthesis gas is joined by unreacted gases from the synthesis loop and the combined stream passes through an oil separator. Synthesis is conducted in a five-bed reactor. Feed to the reactor is heated up to about 900° F. by heat exchange with products of reaction and by the heat of reaction. Ammonia and unreacted gases, following heat exchange with incoming feed in the converter, leave the converter at 450° F.

Since this is a low-pressure ammonia synthesis, refrigeration is required to condense the ammonia. Gases leaving the converter are first cooled by water to about 100° F., further cooled in a tubular exchanger by heat exchange with the recycle gases, and finally liquefied by ammonia refrigeration. Unreacted gases are circulated by a reciprocating compressor back through the synthesis loop to join with the fresh feed.

Nitric acid . . . Ammonia is vaporized and passed with air over a platinum gauze catalyst. Oxides of nitrogen are formed in a reaction taking place at about 1,700° F. Product gases are cooled and absorbed in water to form nitric acid.

Nitrogen solutions . . . Nitric acid is neutralized with ammonia to form ammonium nitrate and water. This resulting solution may be sold as such or by absorption of additional ammonia nitrogen solutions of varying strength may be made.

Illinois Farm Supply Co. facilities have recently been installed adjacent to the U.S.I. ammonia plant. This company buys solutions from U.S.I. and is distributor of finished fertilizers.

In late 1955, U.S.I. put on stream a natural-gas reforming unit as an additional source of hydrogen. Natural gas from Panhandle Eastern Pipeline compressor station provides both process gas and fuel gas. Reforming is conventional. A six-cell reformer furnace is employed, four tubes per cell. Tubes, packed with catalyst, are supported at the bottom with allowance for expansion upward.

Acknowledgment

Appreciation is expressed to D. J. Patterson, plant manager of U.S.I. ammonia plant, and to Bill Powell, assistant plant manager. Ken Knox is ammonia superintendent at Tuscola.

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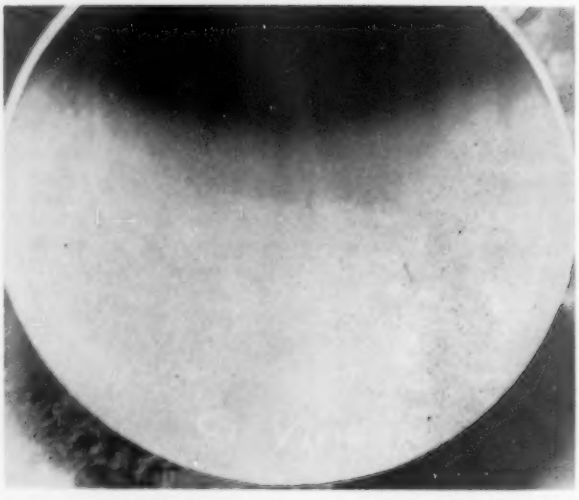
BEFORE cleaning, here's how cutout sections of the line looked. The line efficiency at this time was only 71 per cent. Fig. 1.



AFTER cleaning with detergents, the pipe looked like this. About 5,000 gal. of fluid was removed and the efficiency raised to 92 per cent. Fig. 2.

Washday for a Mountain Pipeline

Using detergent to clean a pipeline in level country presents no great problems. But in mountainous terrain great care must be taken to keep the cleaning pigs under control at all times to prevent line damage. Here's how one company did the job on a mountain line.

by A. S. Olson

SUCCESS in cleaning pipelines in mountainous country depends on selection of proper tools, equipment, and detergent, on careful planning of the job, and on careful control of rigging operation.

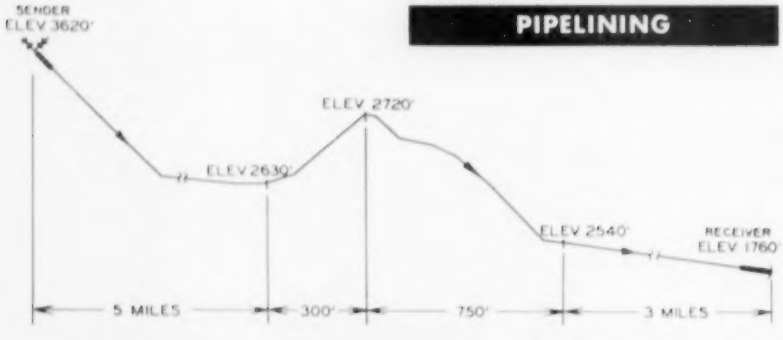
These three major factors are much in evidence in the experience of Southern California Gas Co. in cleaning a section of old 22-in. line north of Los Angeles.

Author is engineer with Southern California Gas Co. Paper was delivered at the Pacific Coast Gas Association Gas Supply and Transmission Conference, Las Vegas, Nev., 1956.

The line had been laid in 1929 and efficiency tests showed that cleaning of a 14-mile section could not be deferred. Fig. 1 shows the condition of some of the line. At this time the line showed a 71 per cent efficiency. After cleaning this was raised to 92 per cent. Results can be seen in Fig. 2.

Steep gradient . . . Previous internal pipeline cleaning jobs by this company had been in relatively flat country, using various pigs and a ball-and-chain crawler. In flat country, with relatively straight runs of pipe, controlling these devices had not been a problem. But in the steeply sloping mountain line it was expected that control would be more difficult.

One section of the line rises from 1,760 ft. to 3,620 ft. elevation in less than 9 miles. It was to be cleaned from the top down, opposite to the direction of gas flow. Fig. 3 shows a profile of the section.

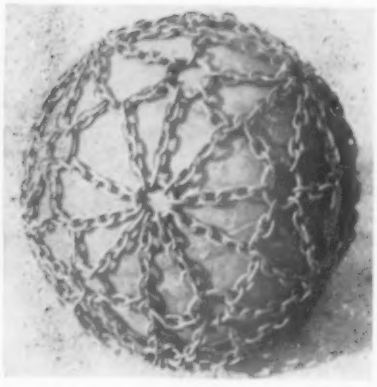


LINE PROFILE shows sharp drop in the 9-mile section. Cleaning was from high to low end. Fig. 3.

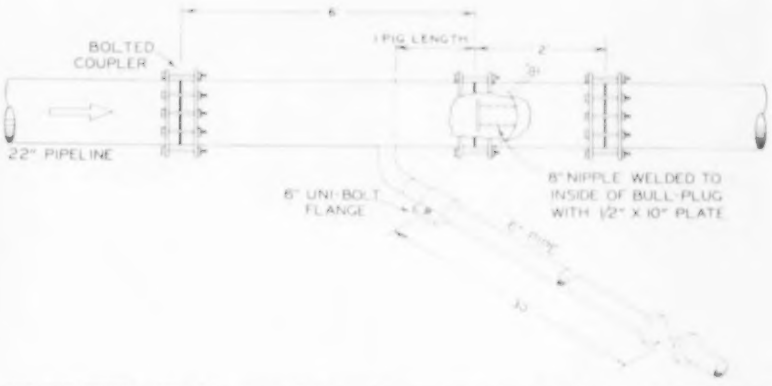
Planning Job, Getting Material

This article describes tools and equipment used in cleaning the 22-in. line and the methods and techniques of control which were developed for the job. Characteristics of the pipeline helped determine the kind of tools used. The line was built with double-bell end pipe and arc welded with backup rings. Angles up to 3° had been made by inserting a plain end into the bell. Angles from 3° to 10° were made with wrinkle expansion joints while larger angles were made with welding angles.

An inflated ball-and-chain crawler was to be sent through the line first. It was believed that the crawler, shown



BALL-AND-CHAIN crawler used for first cleaning pass. Fig. 4.



PIG RECEIVER. The 6-in. connection was for pressure control and had an important part in controlling pig speed. Fig. 5.

in Fig. 4, would move heavy deposits out of the sags and on down the line. The crawler was half filled with water, then inflated with nitrogen. Because of crawler's construction it was felt that if it could go through the line there was a good chance a regular cleaning pig could make it.

A short-coupled pipeline pig was selected for the cleaning job because of the sharp angles. This pig had 2 heavy rubber cups and 12 brushes. Mounted inside is a whistle which helps in locating the pig as it travels. Bypass nozzles are also provided to permit gas to flow through the brushes, keeping them clean, and to move the material ahead of the pig. During the deterging operations, all bypass nozzles were closed.

To get the pig in the line a special sender was made by cutting a 10-ft. section of 22-in. pipe out of the line. The pipe was chained in place on a truck and a loose-fitting sleeve (24-in. swaged to 22-in.), was placed over the end. The truck wench pulled the pig through the taper and into the sender.

A slotted-type receiver was built to stop the pig. It had 12 slots ahead of a compression chamber into which the pig came and compressed gas ahead of it. A spring was also mounted in the end of the chamber to help absorb the shock.

This slotted receiver worked very well, but because of other control problems, it was necessary to build a gastight receiver. The gastight pig receiver used in the deterging operation was a short section of 22-in. pipe with a bull plug and a 6-in. connection at the bottom, as shown in Fig. 5. A 6-in. valve in the connection was throttled to control the speed of the pig in the main line.

Choosing the "soap" . . . To determine the type of detergent to be used a chemical analysis was made of the material found in the pipelines. This analysis was as follows:

Component—	Per cent by weight
Oils	21.8
Water	3.0
Iron as Fe_2O_3	64.0
Silica	10.1
Sulfur as S	0.7
Sulfates	Trace
Chloride	Trace

Our laboratory tested many detergents on this material to find one which would emulsify the oil and disperse the solid particles to stay in suspension. Oakite No. 21 was recommended in proportions of ½ lb. to 1 gal. of water. The laboratory recommended agitation of the solution in the pipeline and this was done by permitting gas to pass through the pig and to bubble through the solution.

Details of Cleaning Operation

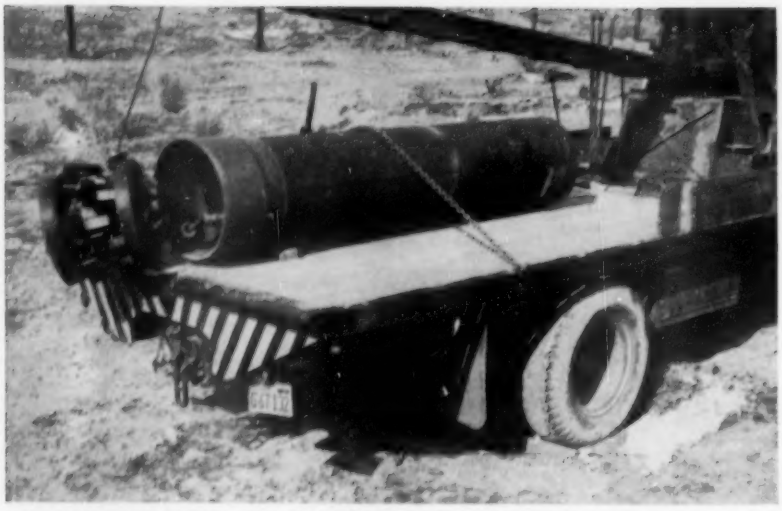
For convenience and control, the entire job was divided into two sections, one 5 miles long and the other 9 miles long. In the 9-mile section there is an elevation difference of 2,000 ft. The line was cleaned downhill and in the opposite direction from the normal flow of gas.

The pig sender and receiver were installed and the first run was made with a ball-and-chain crawler. The crawler moved through the line with pressures of 2 to 6 psig. and entered the receiver 1 hour and 27 minutes later. No material came into the receiver.

An exploratory run was then made with the pig. A solution of 1,000 gal. of water and detergent was put in the line ahead of the pig to soften the material in the line during this run. About 2,600 gal. of material came out of the line at the receiver, as shown in Fig. 6. The time for this run was 6 hours and 39 minutes. Next the cleaning run was made.

A solution of 3,100 gal. of water and detergent was put in the line ahead of the pig. Approximately 5,200 gal. of material was recovered at the re-

OIL, DIRT, AND WATER at the receiving end of line after last cleaning run. Fig. 6.



SCRAPER IS PULLED into launching joint by truck winch. Joint is boomed down to truck bed, has tapered swedge joint on near end. Fig. 7.

ceiver. The last run was the rinse run and two pigs were used. The first pig was the same as used on the detergent runs. The second was a squeegee pig. Approximately 3,700 gal. of water was put in the line ahead of the two pigs, and 5,000 gal. of fluid recovered at the receiver.

Central problems . . . The foregoing sounds like a simple procedure. Put detergent and water in one end of the pipeline, run pigs through the line, and at the other end remove the detergent plus a lot of material. It was not quite this simple, however.

A major problem was controlling the pig. This required much planning and rather careful execution. The pig was controlled by a 2-in. bypass with a throttle valve around the main line valve upstream from the pig sender and a 6-in. blowdown or stack valve at the same location which was used to lower the pressure behind the pig. In addition there was a 6-in. throttle valve at the pig receiver which was used to control the pressure in front of the pig and thereby the rate at which the pig could travel.

This was very important, because a dry pig will travel at high velocities and cause pipeline damage if allowed to run free. It was found that fluid ahead of the pig provided some braking action on the pig as it tried to accelerate. This was helpful in the operation. Before starting the cleaning operation, the plan and profile of the pipeline were carefully analyzed for the critical points at which the pig might become stuck. Also, the points of rapid change in elevation were located on the ground so that control changes could be made as the pig approached these locations.

A detailed operating plan of each run was prepared before it was started. This included a step-by-step procedure for the work and also a log sheet posted by the supervisor to check the rate of speed of the pig. The log contained an estimated time of arrival of the pig at each key point along the pipeline. A man stationed at each of these points reported by radio when he heard the pig pass his location. The supervisor gave orders by radio for necessary changes in the pressure upstream and downstream from the pig to maintain control.

The log sheet also showed differences in elevation between the points so that the pressure required to move the pig could be checked against the calculated pressures to see whether the pig was stuck or if it was moving according to schedule.

One-Hour Chart Used

A 1-hour chart was used to show pressures behind the pig with a constant volume of gas entering the line. As the pressure increased behind the pig, the pig moved a short distance through the pipeline and stopped, and then repeated this until a pressure was reached where it made a continuous run. The pressure then decreased, as shown on the chart, until there was insufficient pressure to keep the pig moving. This cycle then repeated.

The pressure gage at the control location was watched continuously. As the pig approached a sharp angle, and if the chart indicated that the pig was on a continuous run, changes were made at the receiver and control locations so the pig would enter the angle at reduced velocity.

The profile of the pipeline shows at one location an elevation increase of 90 ft. in 300 ft. of pipe. It was necessary to increase the pressure behind the pig to 47 psig. to move the pig and fluid up the hill. As the pig moved up the hill, the 6-in. valve at the receiver was closed. The instant the spotter radioed that the pig had moved over the top of the hill, the control gas was shut off and gas was vented behind the pig.

The pressure at the receiver raised to 11 psig. When the pressure at the control valve reduced to 11 psig., indicating the pressure on both sides of the pig was equal, the stack was closed. No more gas was added to the system, and the pig was brought the next 2½ miles into the receiver by blowing gas at the receiver.

Fortunately there were no sharp angles immediately downhill from the location where the pig had 47 psig. behind it, otherwise this operation would not have been possible. Under those conditions, it would have been necessary to have the receiver closer to the foot of the hill which would have provided a higher pressure in front of the pig when it started downhill, or to have a large vent or stack at the top of the hill to lower the pressure faster behind the pig after it passed the summit.

The control of the pig at vertical angles, of course, is one of the major problems in cleaning mountain pipelines. Another problem equally important, however, is the control of the pig at horizontal angles.

Summary

It is estimated that in excess of 400 bbl. of material was cleaned from the line by running the pigs through twice and that the line was thoroughly cleaned. Before cleaning, the calculated efficiency of this section of line was 71 per cent. Following cleaning the efficiency had increased to 92 per cent.

Not only do we feel that the results justified the cost of the job, but we were agreeably surprised that the cost was somewhat less than estimated. The direct cost of cleaning the 9-mile section of pipeline, which was the longest section of this line cleaned, was $650 per mile. A month later, using the detergent method, a 16-mile section of 18-in. line in similar terrain was cleaned for $263 per mile.

We feel that the success in cleaning pipelines in mountainous territory depends on three major factors: selection of proper tools, equipment, and detergent; careful planning of the job; and careful control of the cleaning operation. The use of detergents in pipeline cleaning, both in flat country and in mountainous, is a most successful way to insure that the transmission lines are kept in clean condition.

Table 1—Casing programs for Richardson & Bass' 1L Humble-L.L.&E. State Lease 2,414

String and size (in.)	Interval, ft	Description	Cement	Safety factors: Tension	Collapse	Burst	Remarks
Conductor:							
20	Rotary-302	9 joints 20-in. 94-lb., National ST&C	To surface in 24-in. hole with 300 sacks common	Large	Large		Conventional string run without difficulty
Surface:							
13⅜	Rotary-3,003	101 joints 61-lb. J-55 LT&C, J&L, seamless	To surface in 17½-in. hole with 1,500 sacks common	Large	Large		Conventional string run without difficulty
1st Intermediate:							
9⅝	Rotary-1,551	53.5-lb. N-80 X-L Spang seamless	To 6,620 (by temp. survey) in 12¼-in. hole with 2,000 sacks Slo-set with 4 per cent gel, 0.2 per cent retarder	1.51 in air 1.98 in mud	1.02 dry vs. salt water		Weighed 570,000 lb. suspended in 14.3-lb. per gal. mud. No bursting load expected, so no bursting safety factor considered. Run without difficulty
	1,551- 3,212	47-lb. N-80 X-L Spang seamless					
	3,312-11,415	53.5-lb. N-80 LT&C J.&L. seamless					
	11,415-13,656	53.5-lb. P-105 LT&C J.&L. seamless					
2nd Intermediate:							
7	Rotary-4,863	32-lb. N-80 X-L Spang seamless	Cemented inside 9⅝-in. casing with 500 sacks 18-lb. Slo-set	1.51 in air	1.10	To hold 9,060 psi.	Run and attached to 7-in. liner after drilling to TD. Weighed 318,000 lb. in mud. Set with 20,000 lb. on packer
	4,863-13,486	32-lb. N-80 LT&C J.&L. seamless					
	13,486-13,508	Brown Oil Tool packer and liner hanger	Cemented in 8⅜-in. hole with 1,100 sacks 17.5-lb. per gal. Slo-set with 0.5 per cent retarder, 22 per cent weight material	3.7 in air	Less than 1		Set as liner. 5 D.S.T.'s run inside. Plus 4-in. drill pipe running-in string, weighed 270,000 lb. in mud
	13,508-19,752	32-lb. N-80 X-L Spang seamless liner					
Oil:							
5	Rotary-18,756	26.06-lb. P-110 J.&L. seamless nonupset with Hydril RB coupled joint. Made up with 10,000 ft.-lb. torque	Not cemented inside 7-in.	2.18 in mud	Less than 1	Tested to 15,000 psi.	Mill tested to 18,000 psi. with nitrogen. Joints hydrostatically tested during running to 12,000-15,000 psi.
	18,756-18,791	Brown Oil Tool packer and liner hanger	Liner stuck while running in. Later squeezed with Pozmix 140, 370 sacks on bottom, 390 sacks on top	Large	Less than 1		Run as liner on reaching TD. Later completed with above 5-in.
	18,791-21,809	18-lb. P-140 Super Deep Well with Hydril internal and external flush joint. Hung as a liner					
Tubing:							
2⅜ o.d.	Rotary-4,819	4.70-lb. P-105 J.&L. integral-joint					Hung out of tree without packer. Mud displaced after tree in place and tubing hung
	4,819-21,418	4.70-lb. N-80 J.&L. integral-joint					

Here's how pipe was picked for . . .

Casing the World's Deepest Well

In casing its record-depth well, Richardson & Bass was faced with extremely high-tensile, collapse, and burst loads. Not only was well depth great, but tests of formations 5,000 ft. off bottom showed 14,000 psi. The operator had to be prepared for as much as 20,000 psi. on bottom. This article tells how Richardson & Bass picked the casing for these needs. It's a look at what will be facing other operators—maybe sooner than they think.

by Ed McGhee
District Editor

TABLE 1 is a summary of the casing programs for Richardson & Bass' 1L Humble-L.L.&E.-State Lease 2414—world's deepest hole and world's deepest producing well.

To case such a deep, high-pressure hole, Richardson & Bass had to do these things:

1. Put a total of 1,071 tons of steel into the hole.
2. Run the longest (21,809 ft.) string of 5-in. casing on record.
3. Use the heaviest (26.06-lb. per ft.) 5-in. casing on record.
4. Run the first of a new triple-seal high-pressure joint.
5. Use the highest-strength (P-140) pipe yet known put into the ground.

Big pipe . . . The conductor, surface, and first intermediate strings, while larger and longer than usual in most areas, are in line with South Louisiana practice for deep wells. Safety factors in tension and collapse are large enough because the strings are shallow. Since no bursting load should

ever be put on them, the safety factor for burst is not important.

Long string of 7-in. . . . The really unusual casing started with the 7-in. second intermediate string. First, it was not run in a single unit—the lower 6,244 ft. was hung as a liner and the remainder was run after the well reached total depth. Second, the finished string is the next longest (by a mere 13 ft.) 7-in. string ever hung. Only a 19,765-ft. string in a Wyoming well drilled in 1949 is longer.

Richardson & Bass logged several promising-looking sands in the 8⅜-in. hole in which the 7-in. string was to be set. For drill-stem tests to be run inside the 7-in., it had to have collapse strength. Richardson & Bass picked 32-lb. N-80 X-Line Spang seamless which can withstand an internal pressure 9,060 psi. higher than external pressure and a collapse load of 7,400 psi.

There were several problems in casing the open hole from the bottom of the 9⅝-in to 19,752 ft. The hole could slough badly and mud cake would build up on permeable sections any time pipe was out of the hole for prolonged periods. This made it necessary to get casing into the hole as fast as possible. Otherwise, there was danger the pipe would stick off bottom. Another problem was the weight of a full string of 7-in. It would not only put a severe strain on the derrick but its tensile safety factor would be dangerously low.

To remedy these problems, the company decided to run the 7-in. string as a liner to hang out of the 9⅝-in. casing. Doing this allowed leaving the drill pipe standing in the derrick instead of laying it down as they would have to do in running a full string. Moreover, the liner would lower into the hole much faster because it would be run on drill pipe.

This time-saving procedure permitted the crews to get the 7-in. liner to bottom at 19,752 ft. only 12 hours after leaving bottom with the bit.

Had the well turned out to be a dry hole, Richardson & Bass would not have had to bear the cost of the upper section of the 7-in. string.

To prevent pressure differential across the liner during cementing, the slurry was weighted to 17.5-lb. per gal. with Magcobar G-7 weighting material. Although there was some retarder added, the slurry flash set during pumping and the top was later found at 15,978 ft. inside the 7-in. This had to be drilled out and the liner block-squeezed.

High pressure at 17,000 ft. . . . With the 7-in. liner in place, the operator set about drill-stem testing five sands topped at 19,035, 18,542, 17,260, 16,621, and 16,603 ft. All tests were run with a full water cushion and from 5,000 to 6,000 psi. applied pressure to prevent any excessive collapse or burst loads on the 7-in. casing and 4-in. drill pipe. None of the sands were commercial, but two had abnormally high pressure. The zone at 17,260 ft. flowed 95 per cent salt water with 2,950 psi. against a 10/64-in. choke at the surface. The pressure bomb in the test tool showed an initial flowing pressure of 14,860 psi. There is no oilfield casing made which could withstand such a collapse pressure when filled with air.

The zone at 16,603 ft. also flowed salt water.

During the above drill-stem tests, there was a short fishing job as well as the drilling of retainers.

Deep 5-in. liner . . . When drilling reached 22,559 ft., the well kicked with 18-lb. mud in the hole while the bit was being pulled. Hydrostatic head of the mud at total depth was more than 21,500 psi. During the time the well was being brought under control there was sometimes 3,000 psi. on the 9⅝-in.—then the smallest string reaching the surface.

With the well under control, total depth was extended to 22,570 ft. and operator set about placing a 5-in. liner to bottom in the same way that the 7-in. liner had been run. The liner was made up of 75 joints of 5-in. 18-lb. P-140 pipe with Hydril flush-joint threads and was run on 4-in. 14-lb. J&L vanadium drill pipe. When pipe stuck at 21,809 ft., operator could not free it. For that reason, the drill pipe was freed from the liner and it was left without engaging the hanger or collapsing its packer.

The operator then set a 5-in. retainer in the liner and squeezed the bottom with 370 sacks of Pozmix 140. Final pressure was 5,600 psi. Then, the top of the liner was squeezed through a retrievable tool with 390 sacks and a final pressure of 4,500 psi.

Safety factor in tension for the liner was high. However, because of the extreme depth, it was not possible in the usual manner of calculation to get safety factors above one for burst and collapse. Richardson & Bass had no choice but to use the highest-strength pipe available—P-140. This National superdeep well pipe will withstand a bursting pressure of 19,000 psi. Made by the quench and temper process, this casing is believed to be the first P-140 ever put into a well.

Seven-inch completion string . . . After the 5-in. liner had been cemented, the 7-in. pipe was completed to the surface with the pipe shown in Table 1. Five hundred sacks of cement weighted to 18 lb. per gal. were pumped into the 7-in. liner. When the top plug bumped, the 7-in. pipe was set down into the Brown Liner connector sleeve to seal the upper section into the previously set liner.

The Oil String

After the 7-in. intermediate pipe was completed to the surface, the 5-in. liner was ready to complete to the surface also. Richardson & Bass had reason to expect the highest formation ever uncovered; already drill-stem testing showed abnormal pressure at 17,000 ft. and the well had kicked from below 20,000 ft. To withstand the pressures, the oil string had to have the greatest possible burst strength and the greatest possible resistance to leakage of the joints.

The pipe chosen was 5-in. 26.06-lb. P-110 J.&L. plain-end seamless. Tests on this pipe showed a minimum of 128,000 psi. yield and 148,600 psi. ultimate tensile strength; elongation was 24 per cent and area reduction of 45 per cent. It was the first such pipe ever made and was especially designed for this job. High strength came from the quench and temper process.

Couplings are of heat treated 4142-steel stock machined to size. Rated as P-110, minimum measured yield is 142,300 psi. and ultimate tensile strength 157,800 psi. with elongation of 18 per cent and area reduction of 57.3 per cent.

"RB" joint . . . Fig. 1 is a cross-section of the Hydril RB joint used on the 26-lb. 5-in. pipe. Note that it has two 14° tapers; these make contact and seal as the joint nears makeup. At complete makeup, the shoulder between the two thread steps also butts up and seals. To prevent overtorquing of the joint, the shoulder on the coupling itself would butt up if the joint is further made up.

This triple-seal joint is applied to plain-end seamless pipe. For that reason, it is especially suited to the P-110 pipe. Most operators prefer not to use upset pipe in the high-strength ranges above N-80. This RB joint was used for the first time in Richardson & Bass' well.

Actually, the RB joint is only one of several checked by an independent laboratory for possible use in the deep well. To test for pressure tightness, samples of the joints were hydrostatically tested to 22,000 psi. Then, the joints were charged with nitrogen to 18,000 psi. in a water bath at 180° F. Then, after 20 minutes, the bath-water temperature was changed to 95° F.

After 20 minutes at this temperature, the specimens were returned to the hot bath. Although the pressure dropped to 15,800 psi. in the cold bath, none of the RB joints lost any gas; no bubbles whatsoever showed in the water bath.

When the joints had been cut on the pipe at Hydril's Rochester, Pa., plant, both pipe body and joints were again tested to 18,000 psi.

Besides having pressure tightness, the RB joint has a relatively small o.d. without sacrificing tensile strength. Outside diameter of the 5-in. coupling is only 5⅝-in., but the joint efficiency is still about 80 per cent.

Running the heavy pipe . . . As the heavy-wall 5-in. pipe was being run, each joint was thoroughly cleaned, steamed, and doped with Humble's 701 zinc-base thread compound. Then, the joints were made up to a specified torque of 10,000 ft.-lb.

After makeup, each joint was hydrostatically tested by the Loomis double-swab method to a pressure of 12,000 to 15,000 psi.

Running the 18,756 ft. of 5-in. pipe required about 48 hours, but it was done under methods approaching almost laboratory standards. There were no means overlooked to make the 5-in. pipe absolutely pressure tight. For even a small leak in the 5-in. casing could easily cause complete loss of the well.

Oil string in place . . . After the 5-in. pipe was run in, no cement was displaced. Because of the small clearance between the 5-in. and 7-in. pipe it was barely possible to circulate mud, so pumping cement would have been impossible.

The bottom of the 5-in. pipe was lowered into the Brown liner-connector sleeve. The connector sleeve not only seals the two 5-in. strings together but also seals against the 7-in. pipe with four lead seals and two Hycar seals. Only 20,000 lb. of weight was set onto the liner so that almost all of the top section would remain in tension.

Inside diameter of the liner section is 4.276 in. while diameter of the upper section is only 3.824 in. This undercut makes it difficult to set tools in the liner section. For that reason, cement-squeeze jobs during completion had to be bradenhead squeezes. It might have been more convenient for the liner and completion string to have the same internal diameter, but there was none of the 26-lb. pipe available when time came to run the liner. It was important to get pipe into the hole in a hurry, so the strongest pipe available was run.

Tubing without packer . . . Richardson & Bass' tubing string is the longest ever put into the ground, but is still as simple as possible. It hangs out of the christmas tree in full tension with no packer. The upper section of P-105 tubing gets its high strength through its metal chemistry, not through quench and temper.

The christmas tree was installed and mud was displaced from the well after tubing was in place.

30,000-psi. test tree . . . Hanger for the 13⅜-in. casing is a Gray Tool Co. Type A slip-test, weld-type hanger. For the 9⅝ and 7-in. pipe, the hanger is the Type AA slip-test, weld-type Gray. This latter hanger has long, step-cut slips that spread the bearing load evenly over the area of suspension on the casing. The 13⅜ and 9⅝-in. sections were hydrostatically tested to 6,000 psi. and the 7-in. hanger tested to 10,000 psi.

The 5-in. is hung from a special Type A hanger which has a set of auxiliary slips to prevent pulldown of the primary slip section. This prevents crushing of the casing in the area of slip contact. This section was hydrostatically tested to 25,000 psi. and tested with nitrogen to 17,000 psi. with no leaks. The double-seal characteristic of this hanger confines the pressure to a small area around the bore, thus upgrading the flanges on which it is carried.

Tubing is hung from a boll-weevil type Gray tubing hanger. This portion of the tree was tested hydrostatically to 30,000 psi. and with nitrogen to 20,000 psi. with no leaks. Above the tubing hanger, the tree was tested to 30,000 psi. hydrostatically and to 25,000 psi. with nitrogen with no leaks.

Use Grayloc coupling . . . Above the 7-in. casing hanger, none of the casing nor tubing heads uses flanges on the side outlets. They use the high-pressure Grayloc coupling. This coupling uses an internal seal ring to retain the pressure within the bore of the coupling. Since the area on which the pressure acts is thus reduced, the force tending to pull the coupling apart is only a fraction of the force working against a regular A.P.I. ring-type flange joint.

Above the tubing hanger, none of the valves are flanged; they are also coupled with the Grayloc coupling.

From the bottom of the lowermost casing-head housing to the top of the tubing-head pressure gage, the tree measures 17 ft. 10⅞ in.—a fitting height for the world's deepest well.

BOOK

CHEMICAL ENGINEERING KINETICS, by J. M. Smith. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36. 402 pp. $8.00.

This new book brings to engineering students and practicing engineers the combination of kinetics and reactor design necessary to design, construct, and operate reaction equipment. Emphasis is placed on the engineering problems encountered in designing and operating reaction equipment.

New advances are presented in interpreting catalytic reactions, particularly those occurring on solid catalysts. The important problem of diffusion in pores of solid catalysts is treated in a simplified, detailed fashion.

Design reactor problems where temperatures and concentration changes occur are presented with illustrative examples. Numerical examples of all the important principles are included and in addition a list of unsolved problems is given at the end of each chapter. All examples have been designed to illustrate a single point and have been simplified to avoid extraneous difficulties.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.

Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.

The Index was explained July 7, 1952 (page 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July and October.

Index (1946 = 100)

	1949	1952	1953	1954	1955	May 1956
Pumps, compressors, etc.	135.9	155.6	162.5	166.5	172.2	189.7
Electrical machinery	130.9	152.4	156.4	160.0	162.5	171.8
Internal-combustion engines	124.8	146.5	148.1	150.5	153.2	162.5
Instruments	123.1	146.2	151.8	154.6	162.9	180.3
Heat exchangers	133.0	165.8	174.9	171.1	156.8	188.0
Miscellaneous equipment average	*121.6	153.3	158.8	160.7	161.5	178.5
Materials component	143.6	164.3	172.4	174.6	176.1	188.5
Labor component	137.1	163.1	174.2	183.3	189.6	196.8
Nelson construction index	139.7	163.6	173.5	179.8	184.2	193.5

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

Here are some of the factors contributing to . . .

That Forward Look in Canadian Drilling

Ingenious Canadians are coming to fore with some new equipment items especially tailored for conditions encountered north of the border.

by F. M. J. Valint

IN the past, there has been very little thought given in Canada to drilling improvement or the designing of equipment for adaptability to the local climatic conditions. However, in recent years, there has been a definite trend toward this goal with some very surprising results; so much so that we are being honored by numerous engineers representing some of the best known manufacturers in the United States, who are showing more than just a mere interest in these Canadian designs and techniques.

To be more specific, let us examine the better known and more widely adapted equipment which is designed and/or manufactured here in Canada:

1. Power-drilling sub.
2. Crown block protectors.
3. Engine safety alarm.
4. Engine emergency shutdown.
5. Improved drilling feed control.
6. Mud suction valve.
7. Mud level alarm.
8. Hydraulic rotary table drive.
9. Wellhead swabbing valve.

The prototype of the Altool drilling sub was designed and manufactured by Alberta Oil Tool Co. of Edmonton in 1954; originally it was an hydraulically driven power swivel. This was designed primarily to provide a rotating mechanism for the drilling string in the case of service-rig workover operations such as cleanout, drilling of retainers, etc. This workover tool, in comparison to any power swivel previously designed and manufactured in other areas, incorporated considerably larger capacity both in speed and power; in addition, the swivel had the ability to operate over longer periods of time without heat generation.

Author is drilling superintendent, Hunter Drilling, Ltd., Calgary.

Shortly after this tool had proved successful on a number of workover operations, a major oil company engineer saw the possibilities of its use in overcoming the problem of diamond coring in the Pembina area, which was proving to be most difficult and costly. The character of the formation from surface to the top of the producing zone in Pembina caused a considerable amount of bit-tooth breakage when economic rates of penetration were attained.

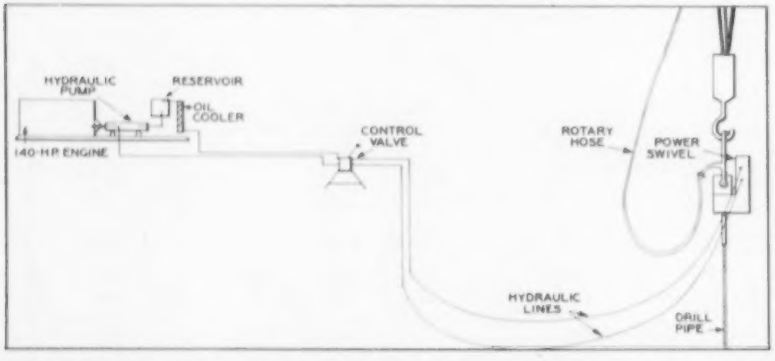
Numerous junk-basket and magnet runs were necessary to obtain any reasonable degree of safety in prevention of damage to the expensive diamond corehead. Even after reasonable care was exercised in removing all small iron from the hole, occasional corehead damage was evidenced. The usual 50-75-ft. core taken necessitated one or more connections, permitting iron to fall to bottom which was impossible to circulate away from the corehead because of the lack of annular space.

Power drilling . . . This company's engineers thought that, if the necessity for pulling out of the rathole could be eliminated, damage to the diamond corehead could be reduced to a minimum. Therefore, the company and the manufacturer decided to design and build a power swivel of sufficient speed and power to drive the drilling string for diamond-coring operations.

This power drilling swivel was designed to have an ultimate torque of 4,700 ft.-lb. and a maximum speed of 115 r.p.m. Upon completion of the swivel, thorough tests were conducted for torque rating and speed. The first test consisted of rotating the drilling string at 8,650 ft. with the swivel hanging from the blocks; the two torque-arm guide lines were tightened and the speed control valve opened slowly. The string was turned at approximately 30-35 r.p.m. and then gradually increased to 100 r.p.m. The bit was then put on bottom and weight increased to 40,-000 lb.

The lack of effort required to rotate the drilling string with the power swivel, regardless of the high weight on bit, was remarkable. The second test comprised the taking of a 36-ft. continuous core. By starting with a slow speed of rotation, it was observed that a considerable amount of torque was developed and was evidenced by the extent of the whipping of the torque arms. However, by increasing rotary speed to the range of 80-85 r.p.m., this condition was completely overcome and coring operations proceeded in a routine manner. The core was cut at a rate of 15-20 minutes per foot at the beginning and gradually increased to 8-10 minutes per foot.

The power swivel was then sent to Pembina oil field for testing on operations for which it was designed. On the third job in that area, the last rock bit, before core point, showed 60 per cent tooth breakage. Under normal conditions, this would have necessitated numerous magnet runs. To prove the theory, the customary magnet run prior to this operation was eliminated;



SCHEMATIC DIAGRAM of the power swivel. It has been used with considerable success during diamond-coring operations at Pembina. Fig. 1.

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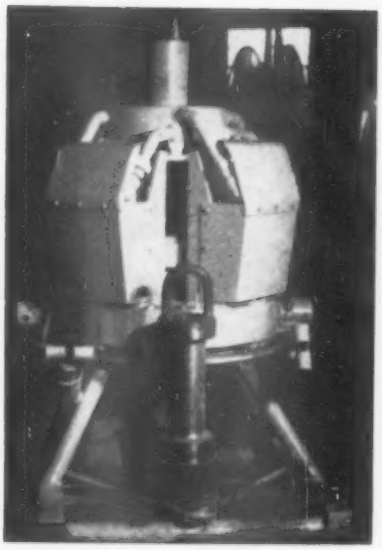
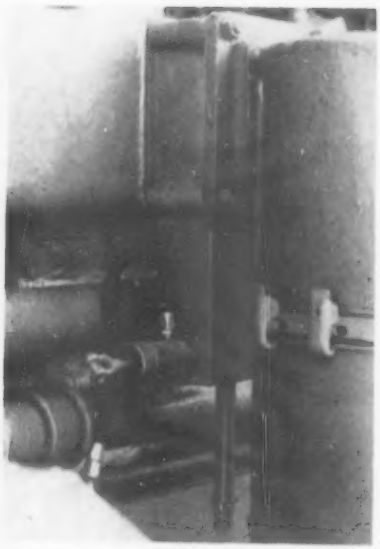


ALTOOL drilling sub is skid-mounted for convenient handling. Fig. 2.



BARBER Rig-Saver is installed on a drilling engine. Fig. 3.

the core barrel was run in and with the core bit approximately 1 ft. off bottom, the hole was circulated for a period of 10-12 minutes with pump pressure of approximately 600 psi.

After circulation the corehead was immediately placed on bottom and the coring operation commenced. When the top joint was drilled down, the slips were set and connection made with no breakage to the core, nor pulling off bottom. This procedure was continued until a total of 68 ft. continuous core had been cut. On pulling the corehead, examination showed no signs of damage. Core recovery was 100 per cent.

After this test was conducted in Pembina in June 1955, the method was established as standard procedure for diamond coring by the company. To date, on all wells cored by this method, damage to coreheads because of iron has been eliminated.

Because of the volume of work in this area, it proved necessary almost immediately to manufacture a second unit. After experience with the original service-rig-model power-drilling swivel and the second larger power-drilling swivel, a distinct improvement in the original design was made.

The second unit manufactured for the Pembina area was a power-drilling sub to be connected to the swivel rather than incorporated in the swivel within the rotating mechanism. The principal advantages of this sub over the swivel were:

- Compactness and streamlining of the unit.
- Reduction in weight.
- A better balanced tool.

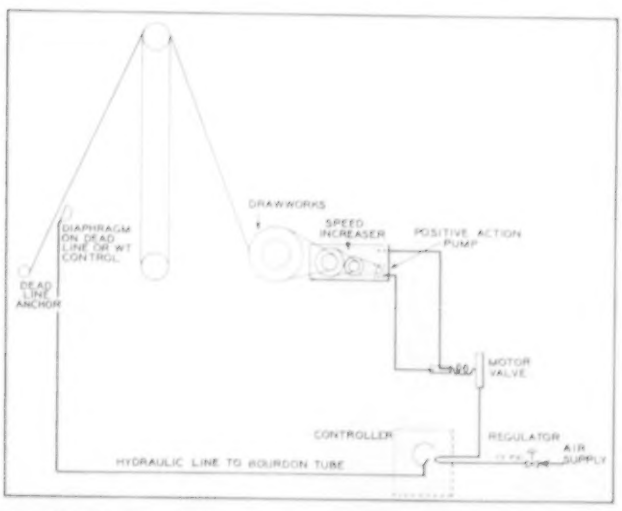
The evolution of the Altool power-drilling sub from the original workover model-power swivel was strictly a Canadian development. It is now being manufactured in California along the basic designs originally developed.

Two sizes of this unit are currently being produced in California. One is designed specifically for service-rig operations. The larger is designed for offshore drilling from barges on the California coast where wave action creates a serious problem due to swaying of the mast while kelly and rotary table are rotating the drilling string.

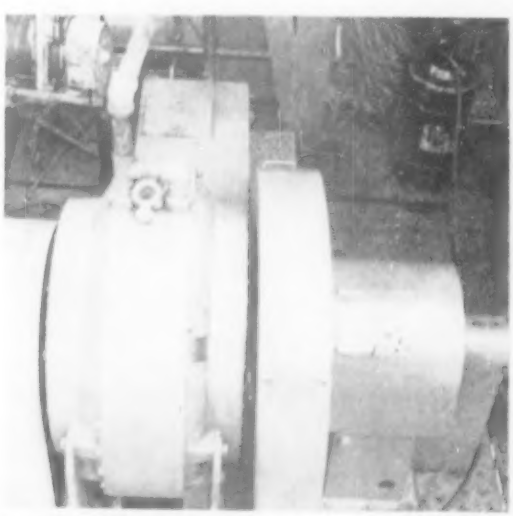
New application . . . An additional important application for the large power-drilling sub has developed. Union Oil Co. of California, operating in Alberta, was faced with the problem of drilling a foothills well on a location necessitating a spud-in on rock outcrop having no overburden. Union used two 9-in. drill collars to spud; these were driven directly by the power swivel. The hole was drilled in this manner to 78 ft. with a much higher rate of penetration than would be possible with the use of a kelly. After this short surface hole had been made, conventional drilling methods were used.

Nickle Crown-O-Matic Block Protectors

The Crown-O-Matic protector was developed by J. W. Nickle, drilling superintendent of Reading & Bates Drilling Co.; this device is a logical answer to the persistent problem of accidents caused by running into the crown. This ingenious device will apply the draw-



SCHEMATIC DIAGRAM of the improved drilling feed control. The new models are specifically designed to operate in Canada's severe climate. Fig. 4.



COMPACT AUTOMATIC drilling feed control unit is mounted immediately behind the hydromatic brake. Fig. 5.

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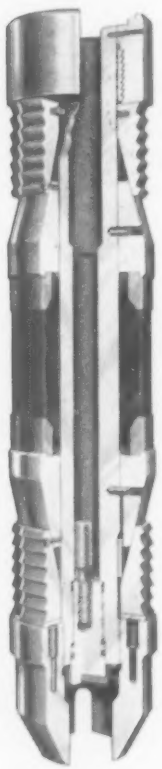

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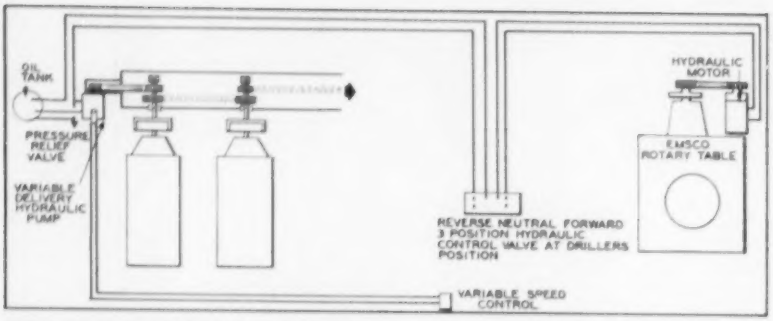
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PRESSURE RELIEF VALVE
VARIABLE DELIVERY HYDRAULIC PUMP
REVERSE NEUTRAL FORWARD 3 POSITION HYDRAULIC CONTROL VALVE AT DRILLERS POSITION
VARIABLE SPEED CONTROL
HYDRAULIC MOTOR
EMSCO ROTARY TABLE

SCHEMATIC DIAGRAM of the hydraulic rotary table drive. The unit is designed to reduce the constant wear and tear on the draw works. Fig. 6.

works brake and disengage hoisting clutches by actuating a specially designed clip valve mounted on the draw works immediately above the drum. This clip valve is actuated by contact with the drilling line as it spools at a predetermined safety point.

A completely different approach to this problem has been developed by P. H. Davies, maintenance superintendent of Trident Drilling Co. Davies' design is in the development stage and has not as yet been tested in the field. However, it will be attached to one of Trident's rigs soon where it will receive thorough tests. Details of Davies' design cannot be divulged at the present time. It will be located and actuated from the draw works and will not involve the mounting of actuating devices high in the derrick at an inaccessible spot. This has been one of the principal disadvantages of previous attempts to develop a foolproof safety device to prevent running into the crown.

Barber's Air-O-Larm

Ideas are born from experience, and it was a Canadian oil-field mechanical superintendent who applied his experience to an idea and conceived the Air-O-Larm in its original form about 6 years ago.

Primarily, the basis for design was a unit to give completely automatic throttle shutdown and declutching control for high coolant temperature and low oil pressure on drilling engines. The several requirements to be incorporated in the design were:

1. Simplicity.
2. No electrical circuits.
3. Vibration resistance.
4. Interchangeability between engines.
5. Minimum of line connections.
6. Ease of field servicing.

Compressed air was the source of actuating power.

The original Air-O-Larm was made up in several sections, each coupled to the other through hoses. This prototype unit had been tested and modified in the field for almost a year, when the idea was brought to Barber Machinery, Ltd. Improved design incorporated all the separate sections in one body eliminating the external hose connections. By using balanced air pressure, O-rings and springs, wear of parts because of engine vibrations was eliminated. All valve action and seals are accomplished with rubber-to-metal contacts, thus avoiding lapped metal-to-metal seats.

Barber's Rig Saver

The Rig Saver idea was started about 2 years ago after several engine runaways resulted from natural gas flooding. Common practice originally involved blocking air intake parts with damp rags to prevent engine runaway.

Later types of shutoff used butterfly valves in the engine air-intake manifold. This type of cutoff did not prove satisfactory since it restricted the air passage and did not provide positive and obvious indication of position.

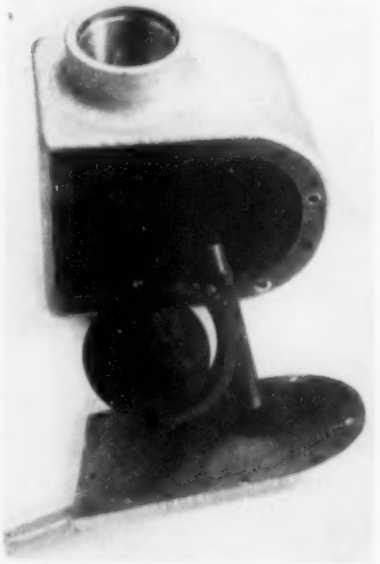
The normal engine vibration wore the butterfly gate spindle bearings. On large engines, the gate valve was practically impossible to install, because of space limitations and sealing of the butterfly plate proved difficult.

A new design was brought to Barber Machinery, Ltd., and the concealed sliding-gate type was then designed which gave free air passage. A larger spindle could be used because it did not restrict the air passage. Closer tolerances could be held in the gate and body, insuring complete cutoff. The installation was easier and cheaper and remote control of the Rig Saver was simpler to install.

Since the original Rig Saver was first made about 2 years ago, it has had little change in its basic design, except for the use of resistant material and further spring loading to reduce movement caused by engine vibration.

Models have been installed on most standard types of engines and basic models with adaptation have been placed on many others.

The problem of runaway engines has become so prevalent in some areas that drilling contractors are required to have an emergency shutdown device on their engines before being allowed on a lease.



CHURY wellhead check valve is used during swabbing operations. The operator can quickly place the valve in either the open or closed position. Fig. 7.

The Valint-Altool Drilling Feed Control

This very compact drilling-feed control was actually designed in Trinidad where the author was formerly employed. It was tried both on power and steam rigs with great success, but was not perfected for cold-weather operation. A prototype model was built by Alberta Oil Tool Co. of Edmonton. It was installed on a major-oil-company rig where the details were worked out for adaptability to the severe climate of this country. The unit consists of a specially designed speed increaser, a hydraulic positive-action pump and air-operated valve, safety device, and a controller, mounted at the driller's position, connected to the Martin-Decker weight indicator, or a diaphragm on the drilling deadline.

Sequence of operation . . . When the drilling feed control unit is put into operation, the driller places the bit as close to bottom as possible, engages the hydromatic clutch and the feed control clutch, and slowly raises the brake until the feed control holds the weight or drill string. The feed control clutch is actuated by an air valve at the driller's position. After the brake is raised, a second air valve is turned on which extends a finger attached to an air cylinder.

The brake handle is rested on this finger and a weight hung on the brake so that, when the finger is removed, the weight will apply the draw works'

brakes. Adjustment of the predetermined weight, by means of a knob on the controller, is made until the desired weight on the bit is established and then is hung on the safety device pin.

The sensitive controller now takes over and maintains the weight on the bit within 1,000 lb., regardless of changing formations. As the required weight is reached, the pressure in the diaphragm, or sensator, is dropped proportionately. Therefore, the bourdon tube in the controller assumes a new position and allows the air from the valve diaphragm to escape and the spring starts closing the valve.

As the valve starts closing, pressure begins to build up between valve and pump, slowing down the latter and therefore, through the speed reducer, retarding the unwinding of the drilling line on the drum. This slowing-down effect on the feeding off allows the weight on the hook to increase which, in turn, increases the diphragm pressure to the bourdon tube in the controller, closing the flapper valve, consequently allowing the instrument air to enter control-valve diaphragm, opening the control valve.

The decreased pressure between pump and valve allows the rotary positive-action pump to turn much faster. Hence, the line of the drum unwinds proportionately.

A valve positioner is attached to the yoke of the control valve. This is a very sensitive type of relay. It not only speeds up by many times the action of the control valve, but positions the control valve more accurately than can be accomplished by means of a controller alone. This eliminates hunting of the feed control and varying weight on bit, thus increasing the sensitiveness of the unit by a considerable degree.

The increased speed of action obtained with this device creates an important advantage, particularly when drilling in alternating hard and soft formations. Many drilling feed controls of the older type had a tendency to feed off a considerable amount of weight on the bit over the determined weight when suddenly drilling into hard formation from a very soft one.

The extreme rapidity of reduction in feedoff of the drilling string, created by the use of the valve positioner, holds this increase to an absolute minimum when this condition is encountered. Therefore, the valve positioner eliminates this problem which is prevalent with manual drilling or with the older types of drilling feed controls; thus damage to bit teeth and bearings is reduced to a marked degree.

A safety device is incorporated in the unit; this eliminates the possibility of an accident through any mechanical failure and allows the weighted brake handle to descend, immediately applying the draw works' brakes.

Barber Mud Suction Valve

At the request of a drilling superintendent the Barber Mud Suction Valve was originally designed. A request was made for a mud valve for western Canadian use, which would include the following design features:

1. Resistant to frost damage.
2. Pass solids without clogging.
3. Full opening.
4. Installed by welding.
5. Positive indication of open or closed positions.
6. Rugged construction.
7. Corrosion resistant.
8. A valve which would split, eliminating unions.

Because there is little pressure on mud suction lines, the open-type valve was chosen. This same feature made it a union. The gate, swinging between the two-section valve body and fitted with positive stops, provided full open or positive shutoff positions.

The steel-body castings are machined for a socket fit on the pipe. A cadmium-plated steel gate, swinging between standard-mud-pump valve-cover gaskets, provides a leakproof and corrosion-resistant combination.

With the increase in mud circulation volume in the past few years and with little increase in mud storage volume, the need of an accurate level indicator became imperative.

The float control type of unit had been used for years. It was found, however, that this type would cake up and lose its sensitivity or become contaminated with added chemicals. The methods of setting these types of level indicators were usually fairly inaccurate.

Standard Air-O-Larm parts were incorporated into the mud alarm, using a large oil-resistant rubber diaphragm and corrosion-resistant parts for actuating the alarm. Several units of this basic design were sent to the field for testing 2 years ago.

It was found that the unit could be set to register drops of ½ in. in mud level and that the diaphragm was not subject to corrosion from chemicals. Since the diaphragm is horizontally positioned under the alarm housing, caking has not been a problem.

Valint-Barber Hydraulic Rotary Table Drive

It is very recently that an actual prototype of this model has been completed and tried out on a drilling rig.

The hydraulic rotary-table drive consists of a hydraulic positive-action pump, driven from the rig compound by a Morse silent chain, a hydraulic control valve and pressure relief valve, volume tank and hydraulic motor fitted on the side of the rotary table, high pressure 1¼-in. pipe and Chiksans.

As this hydraulic pump is a variable delivery type, the absence of heat generation because of the elimination of fluid bypass is one of the most attractive features of the unit. The pump operates at all times, except when making trips or during any lengthy shutdowns; the pump is set on neutral position when the table is not in use.

When drilling commences, throttle and pump delivery are set at the required r.p.m. One of the main features of this unit is the savings of constant operation of the draw works, effecting a truly independent rotary-table drive without bulk.

On rigs where the compound drives both ways, i.e., pump and draw works, there is usually little or no possibility of suitably varying the table r.p.m. to the particular formation being drilled, without having to change pump speed.

Furthermore, on rigs with a limited power supply, this is a serious drawback; calculations show that the draw works on the 400-450 hp. range absorb as much as 32-38 per cent of the output horsepower.

The above unit was designed with a view to eliminating this power drag and giving a complete independent rotary-table control; also, to saving the constant wear and tear on the draw works and, consequently, a reduction in fuel consumption. The unit also has a great advantage over conventional independent table drives, because of its compactness and having practically no weight increase. As you well know a conventional independent table drive is an awkward, long and heavy unit, it cannot be used on a small rig.

Well Head Check Valve for Swabbing Operations

William Chury, a mechanic employed by General Petroleums of Canada, has designed and developed a special valve for swabbing operations. This is attached to the top of the tubing string immediately below the oil saver. The valve can be closed immediately after the pulling of the swab tool.

A prototype of this valve has been manufactured by Alberta Oil Tool Co. and will be tested by General Petroleums in the very near future.

Acknowledgment . . . The author wishes to express appreciation to Joe Blanchard of Alberta Oil Tool, Ed. Brennan of Barber Machinery, General Petroleums, Reading and Bates and J. Harris for their technical assistance and cooperation kindly rendered in the preparation of this article.

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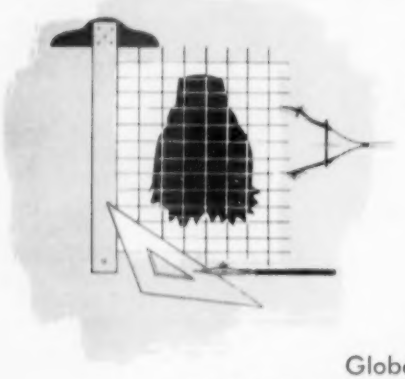
"3-Cutter" Rock Bit



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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Gas Production in Coking

We see so many conflicting statements about the gas produced in coking that we hope you can help us out.—G.F.M.

Such very wide ranges of operation are encountered that no clear answer or conclusion can be offered. However, the ratio of the weight of gas (propane and lighter) to the weight of coke is a fairly clear relationship. Fig. 1 shows that more gas is produced on such a basis by the fluid process and when coking for all gasoline (no gas oil), than when conducting delayed coking. Such a conclusion is somewhat misleading, however, because the amount of coke produced in these types of processes is greatly different. So much coke is formed in ultimate coking that it produces a much larger weight percentage of gas than the other processes. The approximate situation is somewhat as is shown below in Table 1.

TABLE 1—APPROXIMATE YIELDS OF COKE AND GAS BY VARIOUS PROCESSES

Charge stocks: Carbon residue (per cent)	Charge stocks: A.P.I. gravity, Intermediate base	Charge stocks: A.P.I. gravity, Naph. base and cracked	Coke yields, weight per cent: Fluid process	Coke yields, weight per cent: Delayed coking	Coke yields, weight per cent: Ultimate coking	Gas, weight per cent*: Fluid process	Gas, weight per cent*: Delayed coking	Gas, weight per cent*: Ultimate coking
5	26.0	22.0	3.0	8.5	22	2.7	4.8	16.6
10	16.0	14.0	11.5	18.0	37	6.5	4.8	15.0
15	10.0	8.0	17.0	27.5	40	6.9	5.0	9.6
20	6.0	4.5	23.0	35.5	45	7.8		8.6
25	3.5	2.0	29.0	42.0	48	8.8		
30	2.0	0.0	34.5			9.7		
40		−2.5	46.0			12.0		

*From Fig. 1.

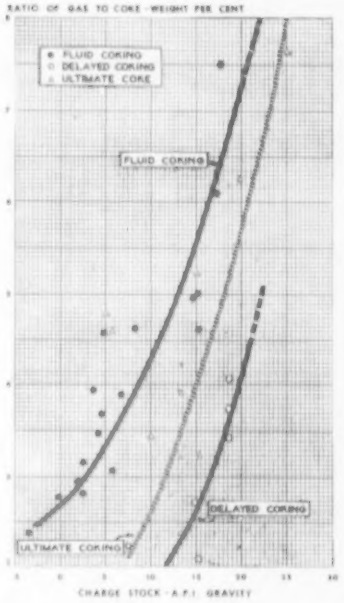


Fig. 1—Approximate yields of gas produced in coking, as a function of the amount of gas produced.

What Are Explosive Limits Of Natural Gas?

What are the explosive limits of natural gas and what is the effect of pressure on the limits? B.S.T.

The explosive limits and autoignition temperatures of some of the more important petroleum mixtures and hydrocarbons are shown in Table 1. Pressure has little effect on the lower explosive limit but it usually tends to raise the upper limit. This is indicated for one natural-gas mixture (Jones and Kennedy, U.S. Bur. Mines Repts. Invest. 3798, Feb. 1945), and for the lighter hydrocarbons (Armistead, G. "Safety", John G. Simmons & Co., Inc., New York, 1950) in Table 2. Pressure increases the percentage range at which explosions can occur.

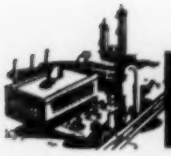
TABLE 1—AUTOIGNITION TEMPERATURES AND EXPLOSIVE LIMITS

	Explosive limits, % by volume in air: lower	Explosive limits, % by volume in air: higher	Autoignition temperature, °F.
Carbon monoxide	12.5	74.2	1204
Hydrogen	4.1	74.2	1076
Acetylene	2.5	80.0	635
Hydrogen sulfide	4.3	45.5	500
Methane	5.3	13.9	999
Ethylene	3.02	34.0	1009
Ethane	3.12	15.0	950
Propylene	2.0	11.1	927
Cyclopropane	2.41	10.3	
Propane	2.37	9.5	871
Natural gas	4.8	13.5	
Butadiene 1-3	2.0	11.5	842
n-Butylene	1.7	9.0	
i-Butane	1.8	8.4	
n-Butane	1.6	8.5	806
Methyl ethyl ketone	1.81	11.5	760
Methyl n-butyl ketone	1.22	8.0	
n-Pentane	1.4	8.0	588
Benzol	1.4	8.0	1076
Cyclohexane	1.31	8.35	
n-Hexane	1.25	6.9	477
Toluene	1.27	7.0	1026
Styrene	1.1	6.1	914
n-Heptane	1.0	6.0	452
o-Xylene	1.0	5.3	924
n-Octane	0.84	3.2	450
n-Nonane	0.74	2.9	
n-Decane	0.67	2.6	above 500
Petroleum ether	1.4	5.9	475
Stoddard's solvent	1.1	6.0	450-500
Gasoline	1.3	6.0	495
Kerosine	1.16	6.0	490
Lubricating oil, spindle			478
Lubricating oil, cylinder			783

TABLE 2—EFFECT OF PRESSURE ON EXPLOSIVE LIMITS

Pressure, psia.	79.6% methane, 19.2% ethane, 1.2% nitrogen: lower	upper	range	Methane: lower	upper	Ethane: lower	upper	Propane: lower	upper	Pentane: lower	upper
Below 1	noninflammable										
1*	4.5	18.0	13.5								
1.9-2*	4.15	12.5	8.35	nonexplosive							
2.9-3*	4.15	13.4	9.25	6.5	10.8						
3.9-4*	4.2	13.7	9.5	6.2	11.5						
10*	4.3	13.8	9.5								
14.7*	4.65	14.0	9.35	6.0	13.0	3.12	9.85	2.35	6.7	1.75	4.7
30*						3.12	10.15	2.3	6.85	1.6	4.8
60*						3.15	10.7	2.35	7.1	1.55	5.2
75*				6.4	14.0	3.2	11.0	2.4	7.35	1.6	5.4
100	4.9	17.5	12.6								
200	4.9	22.6	17.7								
300	4.5	30.2	25.7								
350	4.1	37.5	33.4								

*Read from graphs. †Many scattered points.



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—62

How Dalton's Law Is Used in Distillation

AN understanding of the function of process steam in distillation can be aided by the definition and explanation of Dalton's Law of partial pressure—"The pressure exerted by a mixture of gases is equal to the sum of the separate pressures which each gas would exert if it alone occupied the whole volume." The definition is simple; the explanation is not. Perhaps it can be best explained by starting with a molecule of oil.

A molecule has been defined as the smallest unit into which a substance can be divided and retain all of its chemical and physical properties. All molecules have one thing in common—when vaporized to a given volume at fixed temperature and pressure, a constant number of molecules will be present, regardless of type or weight. For example, a molecule of butane gas (C_4H_{10}) only weighs about half as much as a molecule of vaporized octane (C_8H_{18}), but the volume of each of the molecules is the same, if both are at the same condition of temperature and pressure.

This is substantiated by Avogadro's Law—"Equal volumes of gas at the same conditions of temperature and pressure contain the same number of molecules." This is true for all molecules, whether oxygen, steam, or fuel oil. Now, back to partial pressure.

Partial pressure . . . Assume there is a closed vessel containing equal amounts of two different kinds of molecules, such as steam and vaporized fuel oil, the only difference being that one kind weighs more than the other. Picture these molecules as tennis balls of different colors—white balls for steam and black balls for fuel oil.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

Suppose that the pressure is 10 lb. per sq. in. in this vessel—what causes the pressure? First, the steam and fuel oil have been heated. Heat is energy, therefore energy has been transmitted to the two substances. This results in motion or bouncing of their molecules (tennis balls) against the walls of the vessel. The faster they bounce, the more pressure is exerted against the walls of the vessel.

If there were 500 black balls and 500 white balls, half of the pressure would be caused by the white balls and half would be caused by the black balls. This would make the 10 lb. per sq. in. total pressure in this vessel be divided in this manner; 5 lb. per sq. in. as the partial pressure of the white balls and 5 lb. per sq. in. as the partial pressure of the black balls.

If there were 700 white and 300 black balls in the vessel the pressure would be divided 7 lb. per sq. in. from the white balls and 3 lb. per sq. in. from the black. This is the partial-pressure effect. A peculiar thing is that each type of ball acts independently of the other type. This means that the only pressure apparent to the black balls is that caused when they bounce against the vessel walls. Therefore, for a constant vessel pressure, the more pressure that can be attributed to the white balls in motion, the less pressure is exerted by the black.

For an example of how partial pressure works in the plant, consider an operation in which a fuel oil is being stripped out of a heavy oil by the use of steam. Bear in mind that the temperature at which a liquid vaporizes is affected by the pressure above it. The temperature required to vaporize a liquid varies in the same direction as the pressure—it increases with added pressure and decreases with reduced pressure.

However, **if temperature is held constant,** the amount of the liquid vaporized varies inversely to the change in pressure above it. This means that a reduced pressure will result in an increasing amount of vaporization, or flashing, while an increased pressure will diminish the amount of vaporization of a liquid. Now, back to the stripping operation.

Fuel-oil molecules weigh about 10 times more than steam molecules. Therefore, if 100 lb. per minute of fuel oil is being charged in the heavy oil mixture to a tower and 10 lb. per minute of steam is bled into the tower, there are approximately an equal number of steam and fuel-oil molecules present. Half of the tower pressure is caused by steam and half by fuel-oil vapors.

If the tower is being operated at 10 lb. per sq. in., the fuel oil would be putting up 5 lb. per sq. in. and the steam 5 lb. per sq. in. It is apparent that the fuel oil is distilling under only 5 lb. per sq. in. pressure even though the pressure in the tower is 10 lb. per sq. in.

If more steam is added and the tower conditions of temperature and pressure are held constant, the fuel oil distills at even lower pressures. It is possible to add enough steam to make the oil distill as though it were under a pressure less than atmospheric while the tower holds a pressure of 10 or 15 lb. above atmospheric pressure.

Steam is an effective control of the flash and lower boiling points of a product because the light fractions present determine these particular qualities. However, steam has little effect on viscosity, endpoint, melting point, and other properties. These tests are only slightly affected by the presence of light fractions. For this reason, steam is used to an advantage in the draw strippers of the fractionator where front end boiling points are of major importance.

Among the

Drilling Contractors

Abilene Contracting Firm Adds Three New Partners

Wes-Tex Drilling Co., contracting firm formed in Abilene, Tex., in 1954, has reorganized as a corporation with three new partners.

They are: Myrle Greathouse, executive vice president; N. O. Fiscus, vice president and drilling superintendent; and Miss Elizabeth Cummins, secretary and assistant treasurer.

Robert B. Cockrell continues as president. His brother, Clarence M., of Dallas, is treasurer and assistant secretary.

Slats Honeymon Drilling Co., Oklahoma City, has the drilling contract on a new deep test British-American Oil Producing Co. is undertaking at a wildcat location south of East Marietta field in Love County, southern Oklahoma. The test, 1 Brannan, is projected to 12,700 ft. Spot location is in 24-7s-2e.

Petersen Drilling Co., Shreveport, has two new contract jobs under way for Marlin Exploration, Inc., also of Shreveport. One is a 6,500-ft. Wilcox test in Concordia Parish, East Central Louisiana. Location at 1 Fisher, in 30-7n-9e, is about 10 miles southwest of Vidalia. The other is a 4,200-ft. Sparta test in southwestern Adams County, southwestern Mississippi. It is listed as 1 Butler with spot location in 15-5s-3w, 2 miles northeast of Glen Aubin field, productive from the deeper Wilcox sands.

Eagle Drilling & Development Co., Natchez, Miss., is drilling for Calto Oil Co. and others at a wildcat location 2¼ miles south of Levees Creek field, in southeastern Adams County, southwestern Mississippi. It is a 7,000-ft. Wilcox test at 1 Drane, in 20-5n-1w.

Henderson Drilling Co. is contractor on San Jacinto Petroleum Corp.'s new 9,000-ft. wildcat operation 6 miles southeast of Lolita, in southern Jackson County, Central Texas Gulf Coast district. The test is listed as 1 Susie Coates et al with location in the James Morgan Survey.

W. C. Fatjo Drilling Co., Lafayette, La., has a new contract operation in Beauregard Parish, southwestern Louisiana. It is a Cockfield test for Hunter Co., Inc., at 1 Lutcher. Location is in 11-5s-12w, northwest of production in the Juanita area.

Hunt Drilling Co., Corpus Christi, is drilling for Standard Oil Co. of Texas at a wildcat location 2½ miles south of East Jackson Pasture field, in Chambers County, upper Texas

DAYLIGHT AND EVENING TOUR CREWS on a rig Pronto Drilling Co., of San Antonio, is operating in the Crystal City area in northwestern Dimmit County, Southwest Texas. Front row, left to right: F. D. Davis, daylight driller; Bobbie G. Herd, derrick man; Elmer H. Faseler, engine man; Don Heck, floor man. Back row, same order: Sir Jones, evening-tour driller; W. W. Jones, derrick man; W. A. Montgomery, engine man; and J. Y. Savage, floor man.

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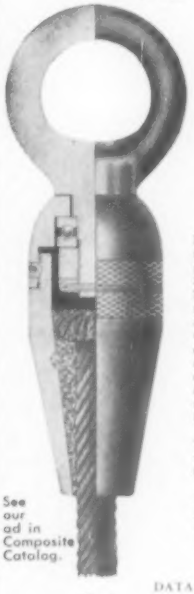

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106	1¼"	5¼	8½	60,000

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Gulf Coast. It is an 8,500-ft. job at 1 Thompson, in the Linkney Lout Survey. Location is 6 miles south of Anahuac.

Bay City Drilling Co. has a rig running for Atlantic Refining Co. in the East Melrose area, 11 miles northwest of Goliad, in DeWitt County, South Texas. Current operation is at 2-B Bluntzer, in the James Cunningham Survey. It will go to 8,000 ft.

Norton Drilling Co., New Orleans, has taken on a 13,000-ft. job for Richardson & Bass in the Little Lake area, 20 miles south of New Orleans, in Jefferson Parish, Coastal Louisiana. It is the operator's 1-A Humble-I.I. & E, spotted in 22-18s-23e.

McAlester Fuel Co., Magnolia, Ark., is contractor and joint operator with Kin-Ark Oil Co., of El Dorado, at a new Travis Peak wildcat test 2½ miles southeast of Three Creeks, in Union County, southern Arkansas. Location is at 1-A Osment heirs, in 14-19s-17w. Objective is expected about 5,500 ft.

Snow Hill Drilling Co., Inc., Magnolia, Ark., is drilling on a 4,700-ft. Cotton Valley test northwest of Louann, in southern Ouachita County, South Central Arkansas. It is a contract job for Berwick-Peaker and associates at 1 Corley, in 29-15s-16w. Location is 6½ miles west of Snow Hill field.

Richard Drilling Co., Corpus Christi, is drilling for Atlantic Refining Co. at a wildcat location 2 miles northeast of Normanna, in Bee County, South Texas. It is a 9,500-ft. test at 1 Brown, in Section 5, Jose Maria Uranga Survey.

Wilbert Phillips is contractor on a Madison exploratory test Victor Ziegler is starting in the Crystal Creek area, 12 miles northwest of Greybull, in Big Horn County, northwestern Wyoming. Location is on government land in 7-54n-93w, south of Crystal Creek field.

Power Rig Drilling Co., Lafayette, La., has a new contract job in the South Bayou Mallet area, Acadia Parish, South Louisiana. It is for Sam J. Recile at 1 Loewer, in 33-7s-1e. Location is east of production.

Fryer & Hanson Drilling Co., Dallas, has contracted for a deep test to be drilled for Texas Crude Oil Co. off the west flank of Jefferson Island salt dome, on the Iberia-Vermilion parish line. Location is at 1 Atlantic & Breaux, in 62-12s-5e, on the Vermilion Parish side. Operator plans to take the hole to 11,500 ft.

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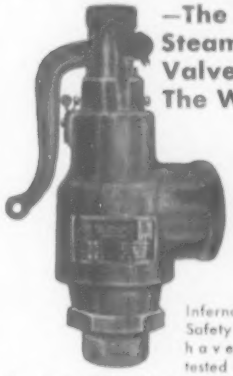

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From Title Search . . .
. . . To Damage Claims

Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Buckeye Pipe Line Co.—Will complete in October or November 1956, own reconditioning of 191 miles of 8-in. from Griffity, Ind., to Lima, Ohio.

• **Gulf Oil Corp.**—Will build 33 miles of 8-in. from Citronelle field to Mobile, Ala., to be completed late summer 1956.

Lakehead Pipe Line Co., Inc.—Anderson Brothers Corp. has under way 51 miles of 26-in. looping from Viking to Plummer, Minn., to complete August 31, 1956. It is in conjunction with 69 miles of 24 and 26-in. to be completed this summer by Interprovincial Pipe Line Co. (See Interprovincial, foreign crude.)

• **Magnolia Pipe Line Co.**—Plans 36 miles of 12-in. from Andrews to Midland, Tex., to be completed January 1, 1957.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)—Will build 350 miles of 8-in. crude and products line from Four Corners area to Salt Lake City, to be completed August 1957.

• **Offshore Gathering Corp., Houston.**—Proposes 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.

• **Pasotex Pipe Line Co.**—Plans 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section, to complete July 31, 1957.

• **Powder River Pipeline Co.**—Fratt Building, Billings, Mont., plans a 20-mile, 6-in. line from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line.

• **Shannon Oil Co., Denver.**—Plans with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont., a 34-mile, 6-in. line from Murphy Dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Construction to start in August, end by December 1, 1956.

• **Shell Pipe Line Corp.**—Has let contract for 41.5 miles of 10-in. from Shell's Houston refinery to Brookshire Station, to complete by December 1, 1956. Bill Murry is spread superintendent for Bill Murry & Co., contractors. Spread office: 12629 South Main, Houston 25, Tex.

• **Sinclair Pipe Line Co.**—Plans 150 miles of 20-in. from Teague, Tex., to Houston.

• **Tecumseh Pipe Line System.**—190 miles of 20-in. will be built by Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co., between East Chicago and Cygnet, Ohio, to be completed September 1957.

• **Union Oil Co. of California.**—Proposes 415-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.

Will build 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif., to be completed late 1957.

Products Pipelines

• **American Pipe Line Co.**—Received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line from Gulf Coast area to New York City area.

• **Cities Service Oil Co. & Subsidiaries.**—Plans a 10-mile, 6-in. L.P.G. line from Maysville to near Pauls Valley, Okla., to tie in to Shell line moving on to Cushing, Okla.

• **El Paso Natural Gas Co.**—Plans 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane, from its Midkiff natural-gasoline plant in Permian basin, Midland County, to El Paso.

• **Gulf Refining Co.**—Will build 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss. (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system. No date set to start.

Magnolia Pipe Line Co.—Plans a 30-mile, 8-in. line from Andrews to Dollarhide, Tex., to complete January 1, 1957, and an L.P.G. line, 19 miles of 6-in., 3 miles of 4-in. from Beaumont to Orange, Tex. Brown & Root has under way a 75-mile, 8-in. L.P.G. line from Hull to Texas City, Tex., to complete January 1, 1957.

• **Mid-Continent Pipe Line Co.**—Has let contract to E. Voigt, Inc., for 12 miles of 4-in. to connect natural gasoline plant at Fox, Okla. Completion is scheduled for August 1956.

• **Phillips Chemical Co.**—Panama Williams Corp. has contract to build 76 miles of 6-in. from Pasadena to Sweeny, Tex., for L.P.G., to complete by September 1, 1956. Spread office is in South Houston, and W. H. Shiflett is spread superintendent.

• **Phillips Petroleum Co.**—Plans 15 miles of 6-in. L.P.G. line in Sweeny, Tex., area.

• **Phillips Pipe Line Co.**—Plans 135 miles of 12-in. looping between Borger, Tex., and St. Louis, Mo., to be completed December 31, 1956.

Plantation Pipe Line Co.—Oklahoma Pipe Line Constructors has under way 327 miles of 18-in. from Baton Rouge to Helena, Ala., to complete December 1956, N. L. Arie, spread man. office at Baton Rouge.

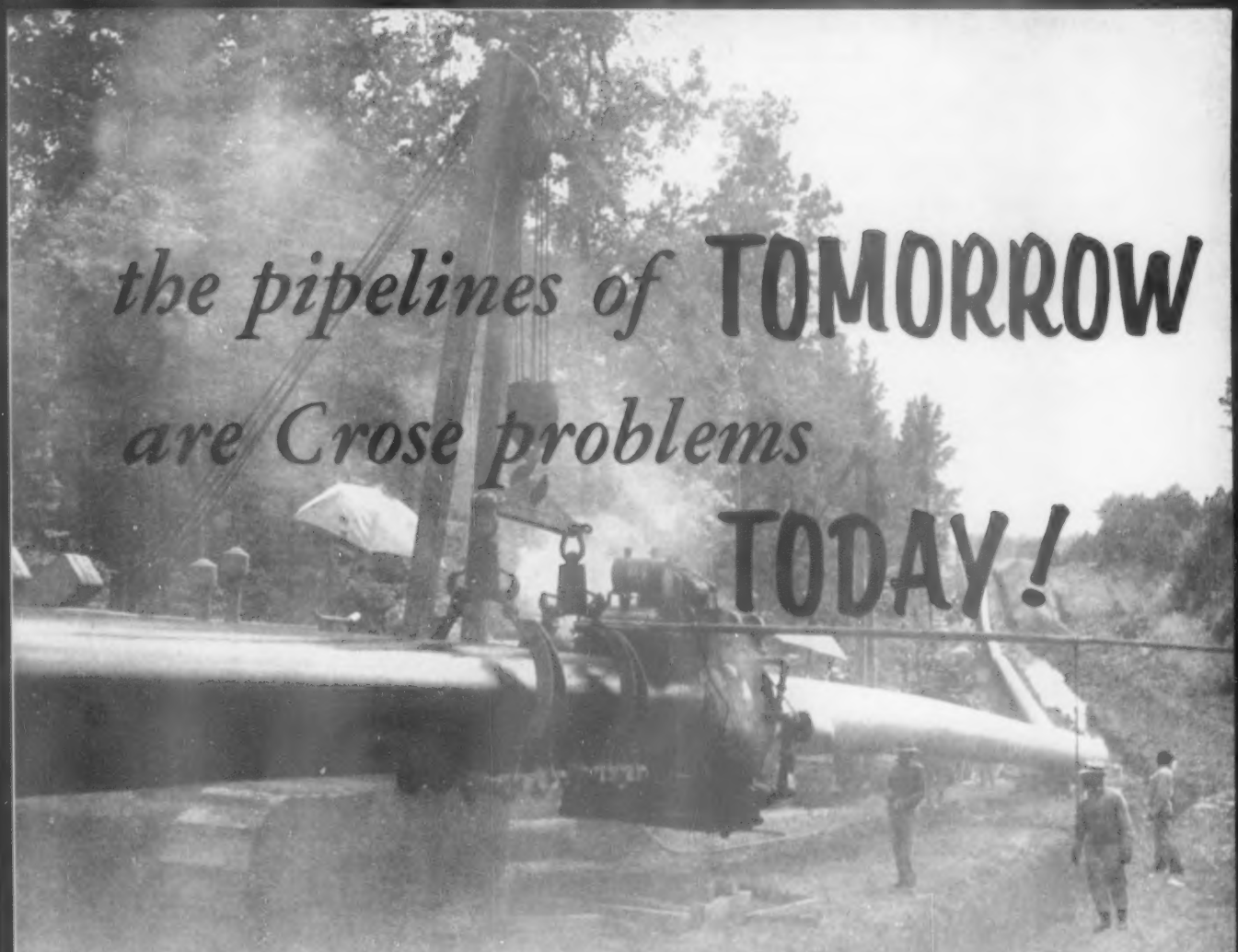
• **Shell Oil Co., Pipe Line Department, Pacific Coast.**—Plans to convert 13 miles of existing 4-in. gasoline line, and add 3 miles of new line, to move gasoline from Wilmington refinery to Los Angeles. To be completed January 1, 1957.

• **Sioux Oil Co.**—Plans 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D., to be completed late 1956.

• **Sohio Petroleum Co.**—Plans 37 miles of 8-in. from Mogadore to Girard, Ohio, to complete November 1, 1956.

• **Southern Pacific Pipe Lines, Inc.**—Plans a 300-mile line to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.

Sun Pipe Line Co.—Contracts let on 109 miles of 14-in. from Twin Oaks, Pa., to Newark, N. J.; Sheehan Pipe Line Construction, 90 miles from Twin Oaks to Plainfield, N. J., J. W. Brown, spreadman, office at Malvern, Pa.; Delaney-Missouri Valley Construction Co., remainder. Missouri Valley Dredg-



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THE FOREMAN'S PAGE

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—41

How to Install and Maintain Power Pumps—1

1 2 3

4 5 6

7 8 9

FEBRUARY 13, 1956 149

1 This sequence of photos by a leading pump manufacturer shows refinery foremen how to do a specific job. The boldface numbers tell the reader quickly that it's a *sequence* spread.

Water-Flood Role Grows

It's now 5 per cent of total U. S. production but look for recovery to reach 60 per cent early in next century

WICHITA FALLS—Water-flood projects eventually will produce the bulk of the nation's oil.

Only about 5 per cent of domestic crude comes from water floods now. But this is destined to jump to 25 per cent by 1980 and to 60 per cent by 2035.

That is the startling trend revealed here last week by Albert F. Sweeney, Jr., director of technical services for the Interstate Oil Compact Commission. He addressed the twenty-sixth annual meeting of the North Texas Oil and Gas Association.

Sweeney declared that the annual production from water floods has increased in the last 4 years from 80 million barrels to 350 million. This represents an increase from about 2.8 per cent of the total United States production in 1950 to more than 5 per cent during 1955.

He termed "this increase little short of phenomenal" but said it is small by comparison with what is coming. Secretary estimated that in 1980 total oil production will reach 3 billion barrels annually with 750 million barrels or one-fourth attributable to water floods. In 2035 total production will have dropped to 330 million barrels with 80 million of this from water floods.

What's ahead . . . Sweeney gave this summary of water-flood prospects:

. . . **Past production:** From 1915 to 1954 total oil production has been 50 billion barrels. Of this 1.2 billion barrels has come from water floods.

. . . **Proven reserves:** In 1955 these were estimated at 40 billion barrels which should last until 1965 at the present rate of consumption without additions. Of this 10.3 billion barrels are water flood production reserves accounted as late as 1977.

. . . **Future discoveries:** These are estimated at 85 billion barrels with 21 billion coming from water floods.

By Sweeney's figures, oil production through 2035 should total 165 billion barrels with the total water-flood production at 33.6 billion barrels. Peak oil production likely will come about 1976, he estimated, and peak water-flood production 10 years later.

Where is oil? . . . Sweeney declared five states will provide most of the stepped-up water-flood production.

Texas, Louisiana, California, Illinois, and Oklahoma will produce most of the increase with sizable recovery from nearly every other oil-producing state in the nation, he said. These states in the past have been the major producers from water floods. And their prospects are best for continued big production.

Water flooding had its beginning in the 1920's in the oil fields of Pennsylvania. Oklahoma was the first state west of the Appalachians to use the secondary technique. The first project started in 1923-24. Production since has increased until it represented nearly 14 per cent of the state's total output.

Kansas current to water flooding in 1935, and more 12½ per cent of its total production is obtained by this secondary recovery method. About 30 per cent of Illinois' total production also is from water flooding.

Texas has stepped up its water-flood production from 8 million barrels in 1950 to almost 50 million in 1955. However, this now represents only 3 per cent of the total Texas production.

But the water-flood trend in all these states and other oil-producing areas will be up for the . . .

Crisis ahead . . . Sweeney is the second speaker in recent weeks to predict the second blank of oil production will reach a peak within the next few years.

M. King Hubbert, chief geological consultant for Shell Development Co., Houston, told the A.P.I. Division of Production in San Antonio earlier this month that domestic production will level off and begin to drop within 10 years. Hubbert said the deficit will be filled by imports and later by nuclear energy.

New Gas Plant for Wyoming

CASPER, Wyo.—Three major oil companies plan to build a $20,000,000 low temperature, natural-gas recovery plant at Lance Creek, in Niobrara County, Wyoming.

Participating in the project are Ohio Oil Co., Continental Oil Co. and Argo Oil Corp. of Denver. The plant will be operated by Ohio.

The 5,000,000 cu. ft. plant will replace one built at Lance Creek by Continental in 1938 and now considered obsolete. A contract will be let soon by Ohio. Construction will begin on the site of the old unit as soon as it is dismantled. Completion is scheduled in 8 months.

The plant will utilize the latest refrigeration processes in recovering gas.

A commercial quick-read said although the plant is designed for 5,000,000 cu. ft., it will process 4,000,000 cu. ft. initially. Production will include 5,200 gal. of gasoline, 3,200 gal. of propane and 10,500 gal. of butane.

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2 For a forecast of the future importance of water flooding, this drawing quickly shows the present status, its probable peak, and its estimated importance by the year 2035.

Here's how The Journal illustrates technical

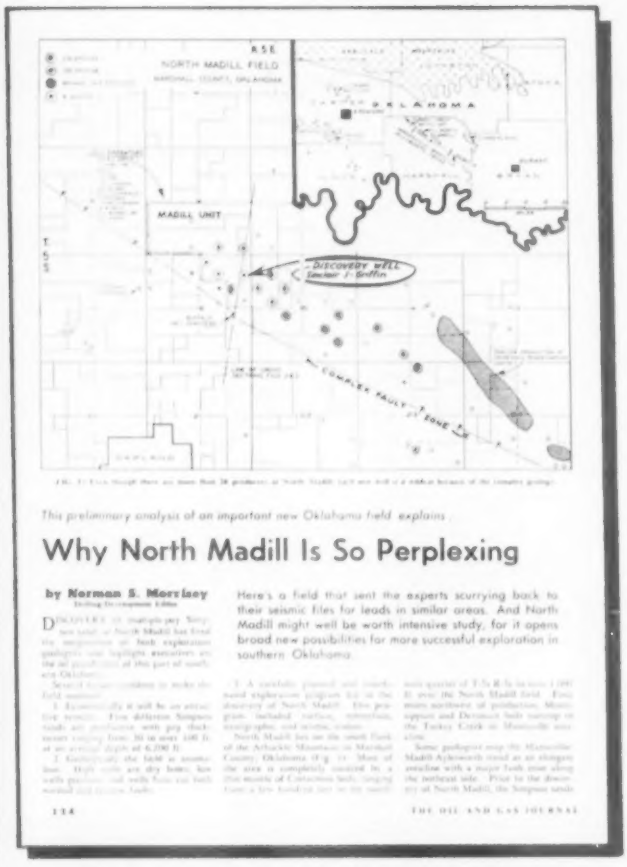
. . . and *why* we do it this way . . .

At The Journal, we look upon illustrations as tools *to demonstrate an idea* and to help move the story off the printed page and into the reader's mind — quickly, easily, and forcefully. This means then that *communication* and not *decoration* is the only reason for using an illustration.

Quite often, an imaginative artist can make a flow chart clearer and more useful by causing some vital part to pop out more vividly. Or what otherwise might be an unrewarding-looking table can be enriched by a color band, by shading, or some other device. But always the only purpose is to demonstrate — not to make a page look pretty or arty.

We try to make the illustrations in The Oil and Gas Journal team up with the headlines so they will work together, and thus double their impact. We arrange page layouts so the reader can "sample"—in headline, deck, and captions. For example, because a reader's eyes naturally read from left to right, we place related illustrations side-by-side, and not above and below, or

THE OIL AND GAS



This preliminary analysis of an important new Oklahoma field explains

Why North Madill Is So Perplexing

by Norman S. Morrisey

Here's a field that sent the experts scurrying back to their seismic files for leads in similar areas. And North Madill might well be worth intensive study, for it opens broad new possibilities for more successful exploration in southern Oklahoma.

134 THE OIL AND GAS JOURNAL

3 This map gives oil men a thumbnail sketch of the geology of a certain area and tells who is active in the field. Indicating the fault line gives clues as to why some wells were dry.

Faster payout for Unit proposed

SACROC Pushes for Bigger Allowable

60 THE OIL AND GAS JOURNAL

4 To explain a complex oil field development to page-thumbing readers, this simple layout: (a) locates the field; (b) quickly tells the problem, and (c) outlines the solution.

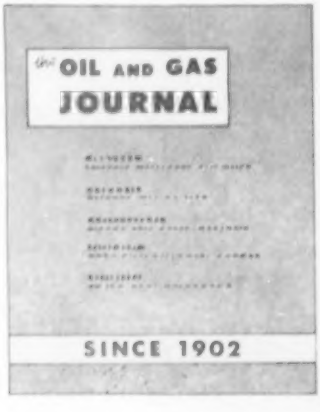
ideas—for maximum speed of communication

in a "flagstone" arrangement. This lets the pictures work harder in getting over the idea.

Our page layouts may not win any art prizes, but as publishers we believe our readers give them the best endorsement we know of — 85 per cent of them renew their subscriptions each year. These oil men regard us as an idea source. They have learned that they can depend upon us to impart these ideas with a minimum of road blocks, arty tricks, or other devices which might call attention to the layout, but which interfere with communication.

Layout for layout's sake defeats the very purpose of layout — to lead a reader to the idea and help him pick it up.

This is the fourth in a series of "workshop" advertisements on the technology of building better business magazine readership.



JOURNAL

TULSA, OKLAHOMA

Pipeline Patrol

ing Co. has river crossings at Delaware, Schuykill, and Raritan rivers. Work started May 1, to end September 1956. Line replaces present 8-in. line. Sheehan will take up 75 miles of 8-in. when new line is finished.

Non-Petroleum Pipelines

• **American Gilsonite Co.**—Plans 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.

Pittsburgh Consolidated Coal Co.—Let to Williams Brothers, 108 miles of 10-in. from its mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Work started April 1, 1956, on this first line to move coal, with Ford, Bacon & Davis, Inc., handling specifications, contracts, construction supervision.

Natural-Gas Pipelines

American Louisiana Pipe Line Co.—Let bulk of 1,160-mile line from North Tepetate, La., to Detroit. H. C. Price and Houston Contracting Co. have 770 miles of 30-in. from near Willow Run, Mich., to near Eudora, Ark. Majority of work completed.

Houston Contracting Co. started August 1, on 21 miles of 24-in. from Tepetate to Lewisburg, La., R. E. Thornton, supt., office at Eunice. Completed.

Houston Contracting Co. and H. C. Price Co. waiting on pipe to start 121 miles of 22-in. from Payne, Ohio, to Bridgman, Mich. Will start this year if pipe available before winter weather. Houston to lay 75 miles on east end, E. C. Norris, spread man. Price to lay 46 miles on west end.

• **Arkansas Louisiana Gas Co.**—Has long-range plans for line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.

Atlantic Seaboard Corp.—Williams-Austin Co. has under way 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, O. L. Martin, spread man, office at Elkton, Va., and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia. Ralph Gaddy, spread man, office at Elkins, W. Va., both to be completed November 1, 1956.

• **Carolina Pipeline Co.**—Has received South Carolina Public Service Commission permit to distribute gas in central South Carolina. Plans lines to 14 cities. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.

• **Cities Service Gas Co.**—Plans 12 miles of 30-in. and 17 miles of 20-in. between Oklahoma City and Mulhall, Okla., to be completed October 1, 1956.

Prairie Construction Co., Inc., has 28 miles of 16-in. between Leavenworth, Kans., and St. Joseph, Mo., to complete August 15, 1956; 9 miles of 16-in. near Springfield, Mo., to complete October 1, 1956; 4 miles of 12-in. from Johnson County to Lafayette County, Missouri, to complete September 1, 1956.

• **Coastal Transmission Corp.**—Applied to FPC for 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Plans 272 miles of smaller gathering lines.

• **Colonial Natural Gas Corp.**—Proposes two systems: One between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

• **Colorado Interstate Gas Co.**—R. H. Fulton has 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs), to be completed fall 1956. Filed, March 29, for FPC permit for 1957 program: 307 miles of 30-in. from Idalia, Colo., to Beatrice, Neb., to take gas from a planned 165-mile, 26-in. line from near Carr, Colo., to Idalia, and from a 72-mile, 26-in. line from near Kit Carson, Colo. to Idalia; 215 miles of 20 and 24-in. to parallel present line from Texas Panhandle area to Kit Carson; 34 miles of 16-in. from Keyes field, Oklahoma, and Greenwood field, Kansas, to the new north-south line.

El Paso Natural Gas Co.—Has under way 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix, both to be completed February 1, 1957. Western Pipeline, Inc. has under way 146 miles of 34-in. between San Juan basin and Topock, to be completed February 1, 1957, and 112 miles of 20-in. between San Juan mainline and Phoenix, to be completed November 1, 1956. El Paso also has under way 34 miles of 24-in. from Ignacio, Colo., to the Blanco plant, to be completed October 1, 1956.

Filed June 1956 for FPC permit for 888 miles of field and main lines in Texas, New Mexico, and Arizona.

Has FPC permit for 28 miles of 10-in. line in Nolan and Coke counties, Texas.

• **Empire Southern Gas Co.**—Groninger & King Construction Co. has a 4-mile, 8-in. loop south out of Pampa, Tex. A 9-mile, 8-in. loop northwest out of Big Spring, Tex., to be completed September 1, 1956, not let.

• **Hope Natural Gas Co.**—Plans 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties, to be completed in 1956.

• **Houston Texas Gas & Oil Co.**—Applied to FPC for 960 miles between Baton Rouge and Miami: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., 12 miles of 12-in. Plans 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

• **Iron Ranges Natural Gas Co., St. Paul.**

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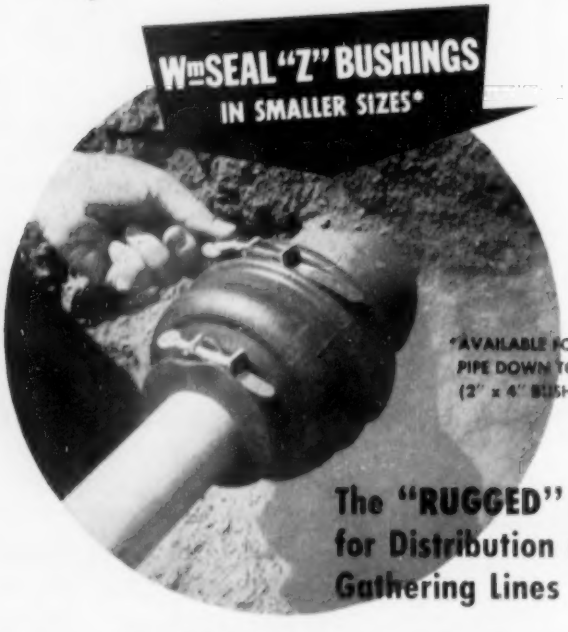

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Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

Pipeline Patrol

—Applied to FPC for a 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minnesota.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Has FPC permit for 11 miles of 12-in. from Colby to Oakley, Kans., to be completed August 1956. Plans 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb., to be completed November 1956.

• **Lone Star Gas Co.**—Has two plans before FPC to enlarge system in Texas and Oklahoma: one is a 230-mile line from Cotton County, Oklahoma, to Fritch, Tex.; one is a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. Plans are attempt to keep Natural Gas Pipeline Co. of America from building line from Wise County, Texas, to Fritch.

Michigan Consolidated Gas Co.—Somerville Construction Co. has under way 67 miles of 10 and 12-in. between Sears and Travers City, Mich., Floyd Huduall, superintendent, office at Cadillac. Somerville, jointly with H. L. Gentry Construction, has under way 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich., Frank Morris, superintendent, office at Hart.

• **Michigan Wisconsin Pipe Line Co.**—Has FPC permit for 252 miles of 24, 18, 12, 6, and 4-in. loops in Wisconsin, to be completed November 1956.

Latex Construction Co., jointly with Houston Construction Co. and H. C. Price Co., has 90 miles of 16 and 20-in. between Milwaukee and Oshkosh, to start June 25 and complete October 1, 1956, John Phipps and U. J. Davenport, spread men, office at Fond du Lac.

H. C. Price Co. and Houston Contracting Co. will build 149.4 miles of loop lines in Wisconsin and Illinois. Price will construct 56 miles of 24-in., and Houston will build 42.4 miles of 20-in. and 51 miles of 16-in. (being handled by Latex Construction Co. of Georgia, office at Fnd du Lac, Wis.

• **Midwestern Gas Transmission Co.**—Will build a main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in. Plans 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin, pending FPC approval.

Montana-Dakota Utilities Co.—Awarded contract to Ross Powers Construction Co., Billings, Mont., to start in August 1956, on 28 miles of 12-in. from Fallon County to Dawson County, Montana.

Montana Power Co.—O'Conner Construction Co., Fromberg, Mont., has contract for 75 miles of 6-in. from Big Coulee field to Lewistown and Harlowton, Mont. Starts September 1.

Mountain Fuel Supply Co., Salt Lake City.—Has temporary FPC permit to build 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

• **Natural Gas Pipeline Co. of America.**—Has FPC approval for 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which will be contested by Natural Gas Pipeline and Lone Star Gas Co. Filed for FPC permit for a 389-mile, 36-in. loop along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co. Also for 91 miles of 30-in. looping to be laid along parts of its main line.

New York State Natural Gas Corp.—Williams-Austin Co. has 17 miles of 30-in. from Caton to Horseheads, Steuben County, New York, starting August 1, to complete November 1, 1956.

Niagara Mohawk Power Corp.—Let to various contractors, 275 miles of 2 to 12-in. distribution mains for growth of service areas in Central, Eastern, and Northern New York, to be completed December 31, 1956.

• **North Carolina Natural Gas Corp.**—This subsidiary of Colonial Natural Gas Corp. has permit from North Carolina Utilities Commission for 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across North Carolina.

• **Northern Natural Gas Co.**—Applied to FPC to add 348 miles of main line, 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. Main lines include 169 miles in Duluth-Superior area, 164 miles in Aberdeen area of South Dakota.

R. H. Fulton & Co. has 28 miles of 20-in. from Redfield to Ogden, Iowa; Beaver Creek and North Racoon crossings; 15 miles of 24-in. north and south of Hooper, Nebraska.

Pentzien, Inc., has 24-in. Elkhorn River crossing.

Plans 73 miles of 20-in., Savanna Creek to Pincher Creek fields in Alta., Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

• **Offshore Gathering Corp., Houston.**—Seeks FPC permit for 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in.; 70 miles of 26-in.; 234 miles of 30-in.

• **Pacific Gas & Electric Co.**—Will build 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento. Has under way a 6-mile gathering system at Beehive Bend. Also plans to loop the Topock-Milpitas line with 135 miles of 34-in., laying major part in 1956, and 62 miles in 1957. A joint-venture firm, Midwestern-Johnson-Dixon, has 85 miles of this to complete in 1956.

• **Pacific Northwest Pipeline Corp.**—Has FPC permit for 37 miles of 6-in. from Dove Creek, Colo., to Nucla, and 13 miles of 4-in.

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Pipeline Patrol

from Nucla to Uravan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America. Work under way on other trunk and sales laterals:

R. H. Fulton & Co., 156 miles 20 and 16-in. lateral from main line to Spokane; also 129 miles of laterals into Idaho, to complete fall 1956.

• **Permian Basin Pipeline Co.**—R. H. Fulton & Co. has 19 miles of 16-in. in Andrews County, Texas.

• **Phillips Chemical Co.**—Plans 79 miles of 6-4-in. ethylene line from Sweeny to Pasadena, Tex., to be completed December 31, 1956.

• **Piedmont Gas Co., Hickory, N. C.**—(Parent is Carolina Natural Gas Corp.) Seeks FPC permit for 78 miles of 2 to 8-in. extension off Transcontinental in North Carolina, to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Portland Gas & Coke Co.—United Engineers & Constructors, Inc., of Philadelphia, has engineering contract for 80 miles of various size lines up to 16-in.

Reynolds Sales Co. — Collins Construction Co. has 20 miles of 10-in. in Corpus Christi Bay and Oso Bay, F. T. Glascock, project manager, Fred Wakefield, general supt., office at Gregory, Tex.

Signal Oil & Gas Co.—C. P. Bartley & Son has 70 miles of 2 to 16-in. gathering system near Tioga, N. D., to be completed September 1, 1956. C. P. Bartley, Jr., and Lawrence Barto, spread men, office at Tioga.

• **Southern California Gas Co. and Southern Counties Gas Co. of California**.—Have permit for 239 miles of 30-in. from Topock, Ariz., to Newhall, Calif., to start November 1956, to complete 1957.

Also building 49 miles of 30-in. from Newhall to Alhambra, Calif. Work is under way by: Alex Robertson Co., 13 miles; Macco Corp., 16 miles; Joe E. Young Contractors, Inc., 19 miles. To be completed December 1, 1956.

• **Southern Natural Gas Co.**—Has temporary FPC authority for 39 miles of loops near Atlanta, Ga.

• **Tennessee Gas Transmission Co.**—1—Bechtel Corp. has 74 miles of 30-in. looping from Glasgow to Danville, Ky., to complete by October 1, 1956, Joe L. Work, spread man, office at Greensburg, Ky.

2—142 miles of 26-in. looping in Ohio, to be completed fall 1956, under contract to: H. C. Price, 81 miles from near New Boston to near McConnelsville, G. A. Reutzel, spread man, office at Chauncey (30 miles completed); Oklahoma Construction Co., 61 miles from near Newcomerstown to near Lisbon, office at Carrollton, Gene Gohring, spread man.

3—Has FPC permit for 63 miles of 30-in. looping from Scottsville, Ky., to Cave City, and from southwest of Danville to northeast of Danville.

4—Has FPC permit for 99 miles of 26-in. looping from Greenup, Ky., to north of Ohio River, from McConnellsville to Newcomerstown, and from Lisbon, Ohio, to near Mercer, Pa.

5—Houston Contracting Co. has 30 miles of 8 and 12-in. near Golden Meadow and Leeville, La. H. E. Murphy, superintendent. Pipe starts immediately.

• **Texas Eastern Transmission Co.**—Applied to FPC, December 1955, for 422-miles of 30-in. from McAllen to Beaumont, Tex., to move imported Mexican gas. Applied for 530 miles of 30-in. looping from Kosciusko, Miss., to Uniontown, Pa. Will lay 45 miles of 24-in. from Provident City, Tex., to connect in Matagorda County, Texas, to tie the Wilcox Trend Gathering System with the extension from Mexico.

Texas Gas Transmission Corp.—Houston Contracting Co. has 195 miles of work in Miss., Ark., and Southern La.: 22 miles of 30-in. and 10 miles of 18-in. reconditioning near Clarksdale, Miss., started August 1, W. H. Hayes, supt.; 31 miles of 30-in. and 10 miles of 18-in. reconditioning near Greenville, Miss., and Wilmot, Ark., started August 5, F. A. Silar, supt.; 122 miles of 20-in. to lay from Eunice, La., to East of Morgan City, La.; M. L. Thompson, supt.

Pentzien, Inc., has Mississippi River crossing near Greenville, Miss., to complete December 15, 1956.

• **Texas Eastern Tgansmission Corp.**—Has FPC approval to build 11 miles of 12-in. in Philadelphia area.

• **Trans Carolina Pipe Line Corp.**, Commercial Building, Raleigh, N. Car.—Seeks FPC permit for 300-mile system across North and South Carolina, plus 500 miles of laterals.

• **Transcontinental Gas Pipe Line Corp.**—Has applied to FPC to lay 160 miles of 16-in., 67 miles of 30-in., and 24 miles of 24-in. loops from Louisiana to Pennsylvania, to be completed December 1, 1956; 25 miles of 36-in. loops from Louisiana to South Carolina, to lay in 1957. Has also applied for 31 miles of 36-in. and 43 miles of 30-in. line to be built during 1957.

• **Washington Gas Light Co.**—Has FPC approval to construct 26.1 miles of 24-in. and 2.7 miles of 20-in., from Dranesville, Va., to Washington, D. C.

Winchester and Vienna, Ill., Cities of—M. L. Hulcher Co., Inc., has 21 miles of 8-in. for Winchester, to complete September 30, 1956, Rolfe, superintendent.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.—Firm is build-

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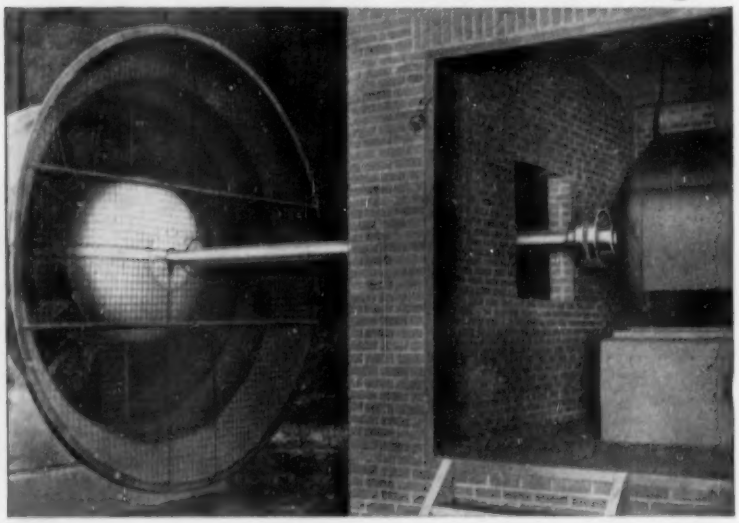

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Pipeline Patrol

ing a 140-mile, 20-in. line from Safaniya field to Ras Tanura.

• **Canadian Gulf Oil Co.**—Seeks approval for 35 miles of 8-in. to connect Drumheli field, Alberta, with existing Gulf lines running to Edmonton.

Cremona Pipe Lines, Ltd. — Dutton-Williams Brothers, Ltd., has 78-mile, 8-in. line from Sundre-Westward Ho region to Calgary, to be completed August 1956. Company is subsidiary of Home Oil Co. Spread office is in Calgary, and F. Peters is spread man.

Creole Petroleum Corp.—Williams Brothers Sudamericana will finish in September 15 miles of 34-in. crude line from Pueblo Viejo to Lagunillas, Vene.

Gulf Italia Co.—Will complete late summer 1956, 35 miles from its Ragusa field in southwestern Sicily to RASIOM's refinery at Augusta.

Interprovincial Pipe Line Co.—Majestic Contractors, Ltd., has under way 67 miles of 24-in. between Carroll and Somerset, Man.; 2 miles of 26-in. between U. S. border and Gretna pumping station, to complete August 31, 1956.

Has applied to Board of Transport Commissioners for 151 miles of 20-in., an extension of its line from Sarnia to Port Credit, Ont. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**—Plans 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion Lateral, Venezuela, to complete first quarter 1957; 24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja, to complete in 1956.

Peace River Oil Pipe Lines, Ltd.—Fulton Banister, Ltd., has contract to coat and bury 45 miles of 12 and 16-in. from Valleyview to Edson, Alta. (Line was welded above ground last year). Jerry Nash is superintendent, office at Valleyview.

Pembina Pipe Line, Ltd.—Sparling Davis Co., Ltd., has 100 miles of 3 to 10-in. gathering system in Pembina field.

Mannix, Ltd., has 200 miles of 3 to 12-in. gathering lines in Pembina field, F. Whitlow, superintendent, office in Pembina field.

PEMEX.—Constructora El Aguila, S. A., has 50 miles of 20-in. from Angostura to Veracruz, Antonio Sanz Polo, spread man, office at Veracruz.

• **Rangeland Pipeline, Ltd.**—Will build 17 miles of 6-in. and 16 miles of 4-in. from west end of Joffre field to connect West Gilby; 10 miles of 12-in. from Gilby Junction to Rimbey field, Alberta. Work to be completed fall 1956.

• **Royal Dutch-Shell**—Together with several other companies, is considering 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, the Netherlands, and Belgium. Main trunk would be 30-in.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**—Will build 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

• **South Saskatchewn Pipe Line Co.**—Building 58 miles of 12-in. from Cantuar field to Dollard field in Saskatchewan, to be completed September 1956.

• **Texaco Exploration Co.**—Plans 22 miles of 12-in. and 3 miles of 8-in. between Westerose and Rimbey pools, Alberta, Can.

Union of Soviet Socialist Republic.—Has under way a 2,300-mile Trans-Siberian crude and products system from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Westspur Pipe Line Co.—Majestic Contractors, Ltd., has 109 miles of 12-in. from Midale, Sask., to Interprovincial Pipe Line Co.'s pump station at Cromer, Man., and 50 miles of various size gathering lines in Midale-Frobisher area, to complete fall 1956.

Yacimientos Petroliferos Fiscales (Argentina).—Has started 700 miles of 12-in. from Campo Duran to San Lorenzo. TECHINT, (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 160 miles of 10-in. and 43 miles of 8-in. from Sicasica to Arica on the Chilean coast, to be completed December 1957.

Foreign Products Pipelines

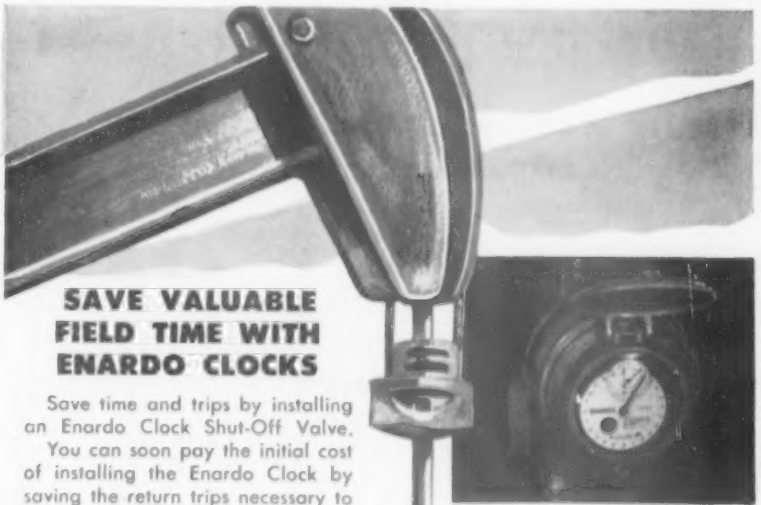
• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 6 miles of 14-in. from the Capuava Refinery to Utinga Terminal, to be completed December 1956.

Hydrocarbons Pipeline Co. (subsidiary of Canadian Hydrocarbons)—Has permit from Parliament of Canada to build 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Ft. William, Ont. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957. Williams Brothers, Calgary, and A. D. Little and Co., Boston will act as construction consultants.

• **Imperial Oil, Ltd.**—Will lay 38 miles of 12-in. loop along present line from Waterdown, Ont., to Toronto.

• **Iraq Petroleum Co., Ltd.**—Plans 75 miles of 24-in., 180,000-bbl. daily capacity, from Homs, Syria, to Tripoli, Lebanon.

National Iranian Oil Co.—Contracts let on 573 miles of 10-in., 40,000-bbl. daily capacity, from Ahwaz to Teheran, Iran; Constain-John Brown, Ltd., London, and Williams Brothers Co., started February 1956, laying southern 337 miles; Enterpose of Paris, has northern 236 miles.



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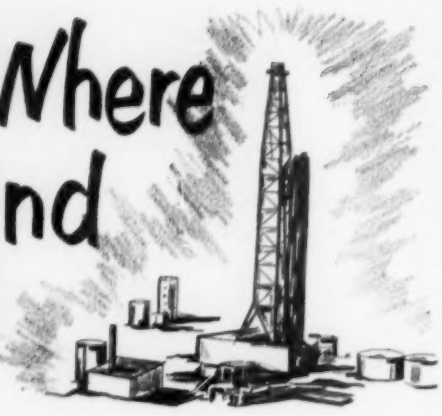

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Pipeline Patrol

• **North Atlantic Treaty Organization (NATO).**—Laying 2,000 miles of lines to airfields in parts of Europe. Associated Pipeline Contractors, Inc., has 450 miles from Iskenderun, Turkey, to Batman. TECHINT (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956, on 300 miles of 12-in. between Marseille and Langres, France.

PEMEX.—Constructora El Aguila, S. A., has 155 miles of 12-in. from Tampico to Cd. Victoria, Geronimo Aviuchastegui, spread man, office at Tampico.

The United States Defense Department.—Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain. Contracts let to Merritt Chapman & Scott; Benson & Montin of Oklahoma City; Agroman Construction Co. of Spain. Prime contractor is Brown-Raymond-Walsh.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 190 miles of 4-in. from Camiri to Santa Cruz, to be completed December 1956.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Plans 547 miles of gathering system for the Trans-Canada line. About 40 miles of 34-in. will be laid in 1956 to connect Bindloss field. Remainder to be laid in 1957 and 1958. Fields to be connected are Pincher Junction, Provost, Sibbald, Oyen, Sunnynook, Steveville, Cessford, Countess, Dutchess, Princess, Homeglenn, Rimbey, Nevis.

Andes Pipeline Corp.—This subsidiary of Glenn McCarthy, Inc., will build and operate 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper mining area.

Attock Oil Co.—Plans 60 miles from Dhulian field to Rawalpindi in West Pakistan.

B. C. Electric Co., Ltd.—Mannix, Ltd., has 10 miles of 18-in. and 20-in. in vicinity of New Westminster, B. C. to complete in October 1956. D. Graham, 546 Howe Street, New Westminster, is spread man.

Canadian Gulf Oil Co.—Has let contract for 10 miles of 8-in. and 12-in. near Pincher Creek, Alta., to Dutton-Williams Brothers, Ltd. Spread office is in Pincher Creek.

Cia. Shell de Venezuela.—Plans 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces. To be completed in 1957.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 16 miles of 6-in. from Cubatao refinery to Elcloro plant, to be completed December 1956.

• **Gas Industrial de Monterrey.**—Plans 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Imperial Oil, Ltd.—Has let 65 miles of 4 to 16-in. gathering system in Redwater area of Alta., to Majestic Contractors, Ltd.

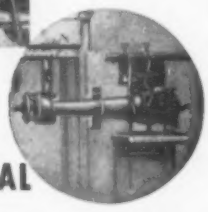
• **Magna Pipeline Co.**—Plans to complete fall 1956, an underwater line from Anacortes or Bellingham, Wash., to Victoria.

North Canadian Oils, Ltd.—Dutton-Williams Brothers, Ltd., has 136 miles of 10-in. from Lake Wabumun to Hinton, Alta., to be completed August 1956, L. A. Stewart, spread man, office at Onoway, Alta.

PEMEX—Plans starting July 1956, on 22-in. line between Reynosa and Monterrey.

Rangeland Pipeline Co.—Has let contract for 44 miles of 4-in., 6-in., and 12-in., from Red Deer to Rimbey, Alta., to Dutton-

VERTICAL



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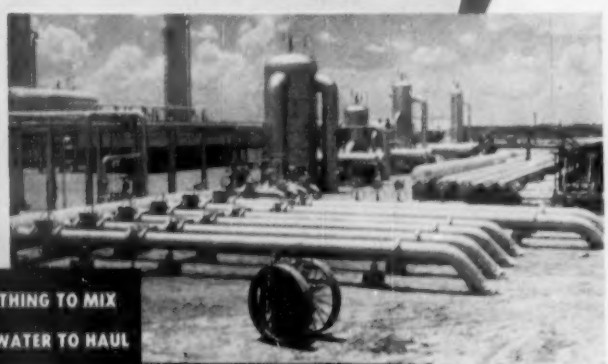

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Pipeline Patrol

Williams Brothers, Ltd., for October 1956 completion.

Saskatchewan Power Corp.—Fulton Banister, Ltd., has 229 miles in Saskatchewan, Jerry Nash, general superintendent: 115 miles of 12-in. from Success to Moose Jaw, starting July 15, to complete September 1, 1956, office at Swift Current; 53 miles of 6-in. from Biggar to North Battleford and 30 miles of 8-in. from Dana to Humboldt, completed; 17 miles of 10-in., 8 miles of 6-in., and 6 miles of 4-in. Hoosier extension and gathering lines from Brock field to Eston Transmission lines, to complete October 1, 1956, office at Kindersley.

South Alberta Pipe Line, Ltd.—Filed permit for 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Sui Gas Transmission Co.—Pakistan Constructors, a joint company of Morrison-Knudsen of Boise, Ida., and William Press, Ltd., of London, have 188 miles of 16-in. from Sui gas field to Moultan, Pakistan. Work begins mid-1956. Line to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**—Proposes a 221-km., 26-in. line from Anaco to La Mariposa near Caracas.

• **Trans-Canada Pipe Lines, Ltd.**—Work begins July 1, 1956, on 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. Contracts let on first four sections to: Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.; Mannix Ltd.; Dutton-Williams Brothers, Ltd. Three sections still to be let. Completion of this stretch planned for December 1, 1956. This is the first stretch of a 2,250-mile line from Alberta to Toronto and Montreal. Deadline for exporting gas from Alberta is December 31, 1957. Tennessee Gas Transmission Co. has proposed a line to take the gas at Emerson, Man. (See Midwestern Gas Transmission Co.).

Westcoast Transmission Co., Ltd.—Has let 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash. Dutton-Williams Brothers, Ltd., has 120 miles from Taylor, B. C., to Azouzetta Lake, to be completed September 1957, O. Graves, spread man, office at Dawson Creek, B. C.

Mannix, Ltd., has 110 miles between Huntingdon and Merritt, Fred Byers, superintendent, office at Chilliwack.

Canadian Bechtel, Ltd., construction division, has 210 miles from Alexandria to Pine Pass, B. C. to complete September 15, 1957, H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.

R. A. Conyes Construction Co. has remaining 210 miles, to complete September 1957.

NEW MAP

OIL AND GAS FIELDS OF THE WORLD. Published by E. C. Jacobson, Maps, 315 Mayo Building, Tulsa, 82 by 62 in. $85. on paper, $100 on linen.

Drawn on Mercator's projection, equatorial scale 1:20,000,000 (scale 1 in. = 300 miles), this new map shows oil fields in green, gas fields in red, all with official field names. The map carries large-scale insets of the following countries, showing oil fields, gas fields, refineries, pipelines, and concessions in color: Argentina, Austria, Canada, Czechoslovakia, Chile, Colombia, Ecuador, France, Germany, Hungary, Italy, Japan, Mexico, Middle East, Peru, Poland, Trinidad, U.S.S.R., and Venezuela.

The OIL AND GAS JOURNAL Showcase

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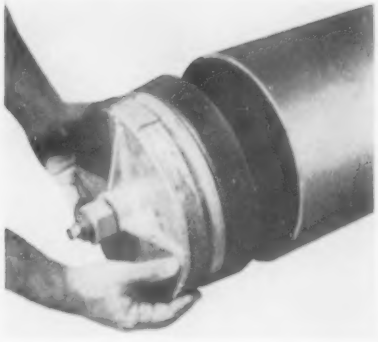
by Dan B. Miller



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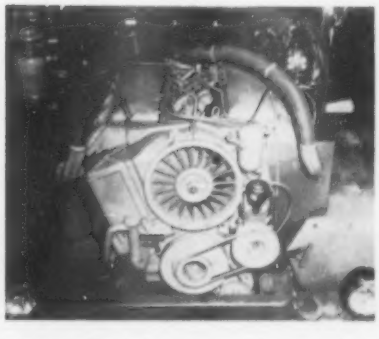

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Combination of a torque-proportioning, fully compensating center differential with the Deutz air-cooled diesel engine results in fuel economy and tire economies of up to 37 per cent. **For more information write or call: Four Wheel Drive Auto Co., Clintonville, Wis.**

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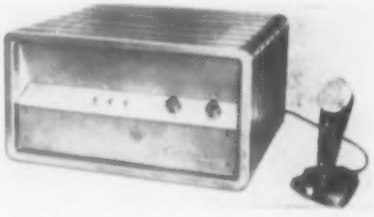

Mobile-Radio Systems Offer Broad Power Output Range

Designed to provide extended and improved coverage and economical operation in low-band radio communication, these high-power systems, incorporated in the Carfone-50 mobile F. M. line, include the CMF-100B series, for 100-watt power output; the CMF-55 series, for 55-watt output; and the CMF-40 series, for 40-watt output. Offering low transmit and standby bat-

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tery drain, the systems can be used for car-to-car and car-to-base station communications.

The new mobile systems have been developed to provide greater scope and flexibility in radio-controlled operation of petroleum, industrial, power, and gas fleets. A principal design feature of the new Carfone-50 systems is sectionalized-chassis design, permitting quick replacement of any inoperative unit with minimum loss of service. Standardized case size, cables, and accessories permit direct interchangeability of the three high-power systems. **For more information write or call: Radio Corp. of America, RCA Building, 30 Rockefeller Plaza, New York 20, N. Y.**

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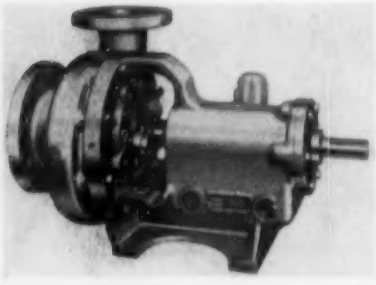


Pumps Handle Hot Process Liquids to 800 G.p.m.

These recently introduced chemical-process pumps are designated as Types DL and DM. They are for pumping most chemical-process liquids, either hot or cold, in moderate capacities against low, medium, or high heads. Available in discharge sizes from 1 through 4 in., the pumps offer enclosed or open impeller design as optional construction. Capacities up to 800 g.p.m. are provided. Types DL and DM pumps will operate against heads to 400 ft. Driver can be standard, horizontal, electric motor mounted on common base with pump.

The new pumps offer two basic designs. Type DL is grease-lubricated for operating temperatures to 250° F. Type DM is oil-lubricated for operating temperatures above 400° F.

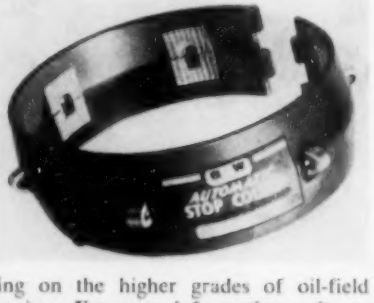
Interchangeability of components enables process-pump users to cut inventory on replacement parts up to 85 per cent. In addition to reduced capital investment, this interchangeability offers two other benefits, (1) greater pump versatility in application, (2) the opportunity of always having the most efficient pump for every liquid condition. **For more information write or call: Peerless Pump Division, Food Machinery & Chemical Corp., 301 West Avenue 26, Los Angeles 31, Calif.**

•

Automatic Stop Collars Eliminate Welding

These automatic stop collars permit the mounting of scratchers and centralizers on higher-carbon and other alloy casing, where welding is not considered a safe practice. The stop collars are positioned on the casing joint and the slips are permanently set by hitting downward on the outer loop with a heavy peen hammer until the loop is flush with the casing. The collars have an interior-concave form with opposed expanding slips which are attached to the outer loops, and the slips securely wedge the collar on the casing.

The device is supplied in solid-collar form or hinged for installation on external upset casing. The simple installation meets the requirements of oversize and undersize A.P.I. casing, casing reciprocation or rotation, and has maximum resistance to movement on the casing. Easy and dependable installations remove the hazard of field welding on the higher grades of oil-field casing. **For more information write or call: B & W, Inc., Box 5266, Houston 12, Tex.**



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Gas Regulator Adjustable From 3 to 400 Psi.

Able to withstand momentary overloads as high as 1,000 psi. on the outlet side, the new 141 regulator offers high capacity in its size range. With a maximum recommended outlet pressure of 400 psi., the 141 operates with a wide margin of safety. The 141 also offers the added feature of four interchangeable orifices and five interchangeable springs enabling the regulator to operate on pressures ranging from 3 to 400 psi.

Changes from one to another of four separate settings in the 3-to-100-psi. range are made simply by replacing the spring. For the fifth setting, 200 to 400 psi., a reducer plate must be used with the spring. The same sturdy diaphragm is used for both low and high pressures.

Other features include increased diaphragm surface area, enabling the 141 to respond sensitively to minute pressure changes; absolute lockup at zero flow, guaranteed by a strong lever-controlled valve and a synthetic material of the measured hardness required for valve disks; a protective cap guarding the spring-adjustment screw from damage such as bending and breaking and thus making it possible to bury the regulator underground and pipe the vent above ground. **For more information write or call: Meter & Valve Division, Rockwell Manufacturing Co., 400 North Lexington Avenue, Pittsburgh 8, Pa.**

•

Pipe Pusher Shoves Pipe Under Roads, Obstructions

The Pow-r Mole is a compact new device for laying water and gas lines under roads, streets, or sidewalks. It will push rigid pipe and pull copper or lead pipe up to 3 in. in diameter. The Pow-r Mole goes on in place of the bucket on any standard tractor-mounted hydraulic backhoe using the

two-bucket mounting pins. One man can dig the trenches, attach the unit, insert the pipe sections, and operate the tractor hydraulics. The Pow-r Mole utilizes the power of the tractor to push or pull pipe, and down pressure on the backhoe boom stabilizes the unit while in operation.

When a major obstruction is encountered when pushing pipe, the pipe can be pulled out and pushed in a different spot to avoid the obstruction. Direction is reversed by changing the position of two drag springs with no need to turn the tractor around. This saves on material costs, because the same set of push pipe will last indefinitely. The Pow-r Mole has a 4-in. stroke and operates at up to 30 tons pressure. **For more information write or call: Pow-r Devices, Inc., Clarence Center Road, Clarence Center, N. Y.**

•

Loading Arm Leakproofed With O-Ring Seal Packing

Available in 2, 2½, and 3-in. sizes, this new loading arm features an antifriction double ball-bearing swing joint which is leakproofed with O-ring seal packing. The loading arm is counterbalanced with a compression-type spring enclosed in a cylinder as a guard against water and weather conditions. An adjustable spring buffer brings the loader to a smooth stop when returning to the upright position.

The unit features a shockless, self-closing loading-line valve and telescopic sleeve. Cast of tested bronze, this valve incorporates a disk which will withstand temperatures up to 300° F. Dual poppet and cam construction permits ease of opening and shockless closing. An adjustment screw allows regulation of closing time when the valve is used under various pressures, eliminating strain or hammering on the connecting equipment. By regulating the adjustment screw the valve may be set for fuels of different viscosities. The valve may be regulated under pressure. **For more information write or call: Oil Equipment Manufacturing Co., Inc., 3100 Vermont Avenue, Louisville 11, Ky.**

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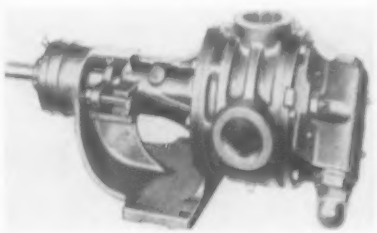

New Pump Series Handles Wide Range of Liquids

Offered in five new series, these positive-displacement liquid pumps employ a circular-tooth design in their rotors and idlers. This feature provides rolling contact and smoother engagement of teeth, resulting in a reduction of friction and in high volumetric efficiency.

Standard-duty pumps, Series A, consist of 10 basic sizes from 3 to over 100 g.p.m. maximum capacities in two speed ranges up to maximums of 650 and 1,800 r.p.m. The group is designed to handle liquids of light to medium viscosities at pressures to 125 psi.

Series B pumps are generally similar to Series A pumps, but they are approved by Underwriters' Laboratories for handling hazardous liquids such as naphtha and benzene, and are distinguished by a special stuffing box, and an alternate mechanical seal.

For heavy-duty applications, the Series C group consists of 650 maximum r.p.m. pumps with maximum capacities in excess of 300 g.p.m. The group is applicable to bulk-station uses, truck mounting, and other extremely rugged applications. Medium to high viscosity liquids are pumped by units in this group.

L.P. gases and other highly volatile substances are handled by Series D units at up to 100 g.p.m. They are distinguished from the Series C group primarily by a mechanical-seal arrangement.

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medium to high viscosities requiring a heated circuit and pump utilize the steam-jacketed Series E group, a modification of the Series C group. **For more information write or call: Wayne Pump Co., 107 Tecumseh Street, Fort Wayne, Ind.**

•

Liner Facilitates Pipe-Wrap Applicator

Serving as both bond and protection, this coal-tar pipe coating uses a tar-saturated close-woven fabric as a carrier. Tapecoat SP is resistant to moisture, acids, alkalis, soil stress, electrolysis, chemical fumes, and fly ash.

Available in 2, 3, 4, and 6-in. widths, the coating comes in rolls from 45 to 50 ft. long. Tapecoat SP is lightly heated with a torch as it is spirally wound in half lap around the pipe. The heat softens the coating to secure a good bond.

The heat also disposes of a film-type liner which is inserted in the roll. This liner makes unrolling easier and faster. It also permits easier handling during application in a wide temperature range. **For more information write or call: The Tapecoat Co., 1523 Lyons Street, Evanston, Ill.**

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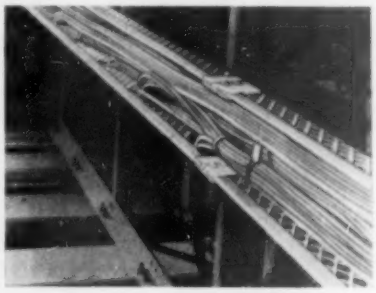

Trough System Supports, Protects Instrument Tubing

Made of expanded metal, a new type trough system supplies support and protection for instrument tubing. This standardized system offers various widths and lengths. A wide range of fittings and accessories permit rapid assembly at the job site to conform to installation requirements. Standardized and prefabricated sections and fittings available from stock allow the advantages of custom design. **For more information write or call: Instrof Corp., Collegeville, Pa.**

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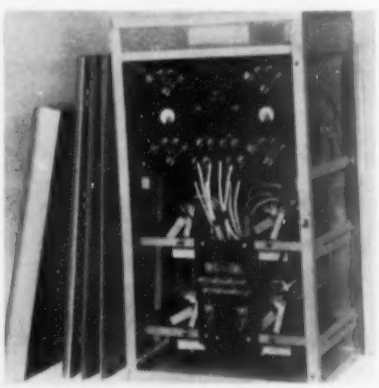

Rectifier Offers Ease of Maintenance, New Design

Custom Line cathodic-protection rectifiers offer compactness, light weight, and easy installation. Air-cooled, the rectifiers use a simple hinged door for access to meters and adjustment controls. The sides and top of the case can be disassembled in less than 5 minutes for easy access to the rectifier parts. The Custom Line features a new transformer and panel design. **For more information write or call: Electrical - Mechanical Division, Good-All Electric Manufacturing Co., Good-All Building, Ogallala, Neb.**

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●

Effect of Convection Heat in Radiant Sections of Tubular Process Heaters. A 12-page technical paper includes charts and diagrams. It discusses the heat input by convection heat that is superimposed on the radiant rates of tubular process heaters by the main stream of fresh combustion products flowing through the heater, or by the stream of gas recirculated within the radiant section of the heater. In addition, the paper describes a series of field tests on several heaters under actual operating conditions, using thermocouples and specially designed flue-gas flow meters. Test results were plotted as isotherm and flue-gas flow patterns. **For more information write or call: Petro-Chem Development Co., Inc., 122 East Forty-Second Street, New York 17, N. Y.**

●

Beckman Process Instruments, a four-page bulletin, contains pictures and brief descriptions of the electrolytic hygrometer, L-B infrared analyzer, leak detector, flow colorimeter, micromicroammeter, RF gas analyzer, pH control system, and the 111 data system. Bulletin 491 offers information on how to obtain additional data on various instruments for process analysis, measurement and control. **For more information write or call: Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif.**

●

International Oil-Field Units. An eight-page catalog and eight-page and four-page folders describes oil-field preparation and drilling equipment. Catalog E-129-F depicts Superior Model PBI-24BH and PBI-24C pipebooms mounted on the International TD-24-502-O rigid frame crawler tractor. Folder E-150-F illustrates the International Superior crawler tractor erection boom, and Folder E-152-F offers reports from users of crawlers, payscrapers, pull scrapers and power units. **For more information write or call: International Harvester Export Co., 180 North Michigan Avenue, Chicago 1, Ill.**

●

Subsurface Equipment and Services. Newly printed for 1956-57, this 15-page catalog covers such subsurface equipment as dual-completion flow heads, separation sleeves, chokes, tubing-locking devices, blanking plugs, and pulling tools. Photographs and descriptions explain each piece. The catalog lists wire-line service companies who sell and service the equipment described. **For more information write or call: Pressure Services, Inc., P. O. Box 13333, Dallas 20, Tex.**

●

The Book of Klinger Jointings, a 2-color, 21-page booklet explains the qualities of compressed asbestos jointing or gasketing. The brochure gives uses, photographs, thicknesses, and weight tables for five types. A six-page foldout presents compressibility comparison graphs. Three pages of the booklet contain tables showing chemicals and the recommended grades of gaskets to use with each. **For more information write or call: Richard Klinger, Ltd., Klingerit Works, Sidcup, Kent, England.**

●

Horizontal, Forged-Steel Cylinder, Steam-Driven, Reciprocating Pumps. Containing two colors and six pages, this three-ring punched foldout gives specifications on a line of single and duplex-style steam pumps. Circular 146A presents sectional drawings with the parts numbered and listed. A full-page chart notes sizes, capacities, pipe openings, and other operating information for the line. **For more information write or call: Dean Brothers Pumps, Inc., 323 West Tenth Street, Indianapolis 7, Ind.**

●

Super 5300 Sprayable Plastisol. A four-page, photo-illustrated bulletin describes the latest improvement in sprayable plastisols, Unichrome Super 5300 plastisol coating. Bulletin SP-1 explains how the specially formulated plastisol can be sprayed in coatings up to 60 mils thick in a single application, even to cold vertical surfaces. Super 5300 coatings protect against a wide range of acids, alkalies, salt solutions, and

complex chemical compounds. They are of particular benefit in protecting tanks, chemical vessels, and similar equipment that cannot be dip-coated economically. **For more information write or call: Metal & Thermit Corp., Rahway, N. J.**

•

Allis-Chalmers HD-11 Crawler Tractor. A series of assembly and parts photographs are used in a new 16-page, 2-color catalog to illustrate the design, engineering, and operating highlights of the company's 75-hp. HD-11 diesel-powered crawler tractor. Catalog MS-1100 also contains specifications and a two-page spread devoted to the line of equipment matched to the HD-11 to increase its versatility and job performance capabilities. **For more information write or call: Allis-Chalmers Manufacturing Co., Milwaukee, Wis.**

•

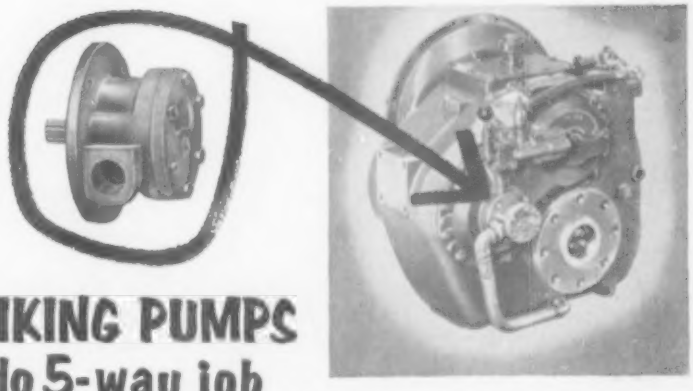
Series 1500 Twin Disc Single-Stage Torque Converter. Offering operator information, Bulletin 508 presents a graph on horsepower to revolutions per minute. The two-color, four-page folder gives engineering drawings and photographs of the Series 1500 torque converter. Applications, specifications, and construction are covered. **For more information write or call: Twin-Disc Clutch Co., Hydraulic Division, Rockford, Ill.**

•

Copes-Vulcan Steam-Assist Desuperheater is described in the four-page Bulletin 1024. The publication provides information on capabilities and specifications of the new desuperheater which applies a new, but well-tested principle to reducing high steam temperatures. The desuperheater meets all specifications for a conventional steam atomizing type yet normally uses assisting steam only on light loads where control is most difficult. The three-color, four-page folder presents cutaway drawings, schematic illustrations, and specifications. **For more information write or call: Copes-Vulcan Division, Blaw-Knox Co., Erie 4, Pa.**

•

Hagan V-Port Butterfly Valves, a two-page specification sheet, describes a line of valves designed for precise control of air or gas. Presenting photographs and engineering drawings, Specification Sheet No. RM-1000 shows that the valves are of the rotating-vane type to assure good control characteristics over a wide turndown range. A unique self-cleaning-vane construction makes the valve suitable for applications involving dirty gas. Excessive dirt ac-



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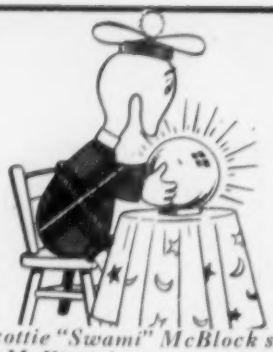

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cumulations can be quickly and simply removed from the valve body without uncoupling the valve from the gas line; the vane is removable. With the use of graphs and tables, the sheet explains that the valves are recommended for gas or air control (excluding steam and water) at pressures below 25 psig. They are not recommended for tight shutoff service. Sizes include 6 to 12-in., with A.S.A. flanged ends. **For more information write or call; Hagan Corp., Hagan Building, Pittsburgh 30, Pa.**

●

Swivels Catalog. Presenting cutaway photographs, this eight-page, two-color catalog covers heavy, medium, and light-duty swivels. Using specification and capacity tables, this publication explains design features. Parts list, prices, and an accessory list are included. The catalog offers lubrication and maintenance tips. **For more information write or call: Gray Tool Co., P. O. Box 2291, Houston 1, Tex.**

●

Entrainment Separators. Bulletin 203 fully describes and illustrates how Schuylernit entrainment separators (mist eliminators) operate, as well as various applications for separators, types of construction, installations and laboratory-proven results. A handy engineering data form is included with the bulletin. **For more information write or call: Schuyler Manufacturing Corp., 84 Porete Avenue, North Arlington, N. J.**

●

Diaphragm Valves and Metering and Proportioning Pumps are covered in the new 16-page, 2-color catalog 9G-56. Included are specifications on diaphragm valves, tables of capacities on metering and proportioning pumps and a schematic diagram of a new pump for precision metering. **For more information write or call: Hil's-McCanna Co., 2443 West Nelson Street, Chicago, Ill.**

●

Verti-Line Turbine Pump. Opening to 45 in. with full-length pump illustration, Bulletin 600 offers in full color, detail cutaway sections of all components of the Verti-Line turbine pump, enclosed lineshaft type. Designed for primary water supply, there are models for capacities from 20 to 10,000 g.p.m. and pressures to 650 psi. The brochure illustrates and describes new Verti-Line Perihedral impeller seal that increases field efficiency and a new dual-bowl bearing which combats abrasion. **For more information write or call: Layne & Bowler Pump Co., 2943 Vail Avenue, Los Angeles 22, Calif.**

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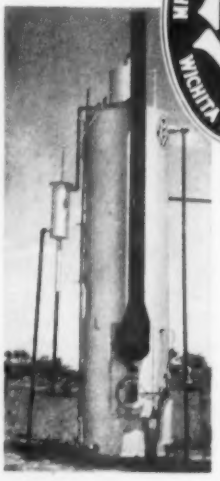

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EQUIPMENT MEN . . . in the News

Fluid Packed Pump Makes Three Sales Promotions

D. ALLEN

Durward Allen has been appointed district manager of the Abilene district of Fluid Packed Pump Co., Vaughn Holton has been named assistant division manager for the Northwest division, and Verlan Lewis has been promoted to assistant division manager for the Gulf Coast division. These promotions were announced by Don Vanderberg, manager of product sales.

V. HOLTON

V. LEWIS

Lane-Wells Appoints Alder As Research Manager

Robert Lee Alder, with Lane-Wells Co. since 1940 and research supervisor since 1952, has been made research manager with headquarters at San Gabriel, Calif., according to Dr. Russell M. Otis, Lane-Wells vice president, research and patents.

Alder will be in charge of all basic and applied research in shaped-charge and bullet perforating as well as research relating to new products and field services.

Replacing Alder as research supervisor is Dr. A. L. Floyd who will have technical supervision of the research projects.

Tyler-Dawson Appoints Fergus, Promotes Griffin

The appointment of Charles M. Fergus to the sales staff and promotion of John E. Griffin to office manager have been announced by Tyler-Dawson Supply Co. The company recently moved into its new office and plant in Tulsa's Sheridan industrial district.

Fergus previously was with Eagle-Picher Co. of Miami, Okla. Griffin became affiliated with Tyler-Dawson in 1954.

Tower Heads New Western Office of Bristol Co.

R. G. TOWER

The opening of a new western sales office in Denver has been announced by H. E. Beane, vice president, sales, The Bristol Co., Waterbury, Conn. R. C. Tower, now manager of the company's Chicago office, will be manager of the new district office.

Tower has been with Bristol since 1922, when he joined the sales force at the New York office. Since then he has been manager of the St. Louis and West Coast offices, prior to going to Chicago in 1940.

Barton to Distribute Librascope Flow Computers

Librascope, Inc., commercial division, Burbank, Calif., has announced that Barton Instrument Corp. of Los Angeles will distribute the new Librascope flow computer line. The flow computers are pressure-compensated totalizing devices for orifice measurements of fluids.

The Librascope units will be incorporated into the Barton instrument line. Field tests have been completed and the flow computers are now being mass-produced by Librascope.

Merging Houston Firms Operate as Bowen-Itco

Bowen-Itco is the name of the organization formed by the combining of two Houston firms, Bowen Co. of Texas, Inc., and Itco International, Inc., according to Dean W. Osmun, spokesman for Bowen-Itco.

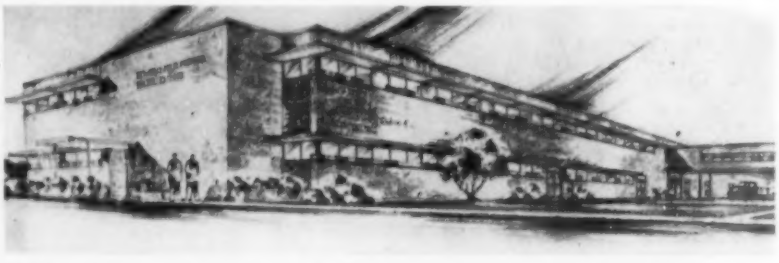
The two companies had been associated, with Bowen Co. manufacturing Bowen and Itco tools and distributing them in domestic trade, and Itco International marketing Itco and other product lines in export.

The late Walter Bowen, one of the founders of Bowen Co. of Texas, was the inventor of the Bowen overshot, a tool used in fishing operations. The company also pioneered in the development of hydraulic rotary jarring tools and wire-line tools for permanent completion operations.

T. H. Evans Elected Secretary of Lane-Wells

T. H. EVANS

Thomas H. Evans, who has been serving as controller of Lane-Wells Co., has been elected secretary and made administrative assistant to the president, according to John J. Neale, president. Evans was controller of Seismograph Service Corp. for 9 years. Since 1954 he has been assistant controller of Dresser Industries, Inc., headquartered in Dallas.



Schlumberger Will Double Engineering Lab and Office

Construction is to begin immediately on a two-story building for Schlumberger Well Surveying Corp. at Houston, to double the firm's engineering laboratory and office facilities. P. Schlumberger, president, has announced. Slated for completion by June 1, 1957, the project will be the ninth building at the company's plant site.

Unique among laboratory facilities planned is a high-pressure testing lab where conditions of heat and pressure equal to those found in a 30,000-ft. oil well can be duplicated. In four test chambers, surveying instruments will be tested in pressures up to 30,000 lb. and temperatures up to 450° F.

Reed Roller Bit Promotes Book, Grundy, Elliott

C. H. ELLIOTT

H. B. Book, J. A. Grundy, and C. H. Elliott have been promoted to vice presidencies for Reed Roller Bit Co., according to R. G. Hamaker, president.

For the oil tool division, Book, former export sales division manager, was named vice president of sales, and Grundy, former factory manager, was

H. B. BOOK

J. A. GRUNDY

named vice president, manufacturing. Elliott, former manager of the Cleco air-tool division, was named vice president of that division.

Book has been with the oil-tool division in both domestic and foreign sales work since 1928. He served as manager of the Oklahoma division, as representative in charge of sales activities in Canada, and as a foreign representative from London, England, before becoming export sales division manager in 1940. Grundy has been with Reed since 1937. He has served Reed as draftsman, purchasing agent, production manager, and materials manager.

Elliott came to Reed in 1940 and since this time has served as plant methods engineer, master mechanic, chief industrial engineer, and assistant to the president. He was made manager of the Cleco air-tool division in 1950.

Allison Moves Petroleum Industry Sales Office

The petroleum industry sales office of the Allison Division of General Motors Corp. is now located in Dallas, Tex., according to J. A. Lane, manager sales-contracts-transmissions operations. This office formerly was located in Tulsa. T. S. McCurdy, Allison sales representative, will continue to serve as head of the office.

McCurdy came to the Allison Division in 1951 as a service representative and later was a service engineer before taking his present position.

New Building to Replace National's Oldest Store

The National Supply Co.'s oldest store was established in 1894, the same year in which the company was founded. In the succeeding years National Supply has opened more than 350 supply stores, of which 128 still are in business. The Butler, Pa., store is the only one dating to 1894 that has survived.

Now, to improve its service to customers in the area, the company has begun construction of this new, modern store building 2 miles south of Butler, to replace the present outdated structure.

The new building, 50 by 80 ft., will include a large warehouse and offices for store personnel, as well as a modern sales room. It will be located on a 1½-acre lot, providing plenty of space for offstreet parking.

Lane-Wells Co. Extends Thru-Tubing Cement Service

Lane-Wells thru-tubing cementing service, which has been available in the Houston area since early in the year, has been extended to include the southern Louisiana territory, according to Claude L. Kirkman, Lane-Wells domestic sales manager.

The equipment used is a 33,600-lb. unit equipped with two diesel motors, either of which is capable of handling 3¼ bbl. of slurry per minute with a maximum pressure buildup of 6,000 lb. A 6-bbl. measuring and a 12-bbl. mixing tank with a jet agitator assures homogeneous cement slurry. A 13,500 ft. by ⅛-in. wire line is used for thru-tubing operations. All tools are available on the truck for running wire-line and cementing services, including 500 ft. of extensible 1-in. aluminum pipe with two 10-ft. telescoping joints for sand-washing operation.

Muldrow Aerial Surveys Promotes H. M. Andrews

H. M. ANDREWS

H. M. Andrews has been promoted to sales manager and executive assistant to the president for Muldrow Aerial Surveys Corp., Midland.

Andrews' new duties include direct management of Muldrow's complete sales and client-relations program, and general supervision of the development, production, and maintenance of the firm's controlled regional base maps.

Prior to his service with Muldrow as Rocky Mountain regional sales manager, Denver, Andrews was employed by the F. Kirk Johnson interests in Fort Worth.

New Firm to Distribute Buda and A-C Engines

A new corporation, Applied Power Equipment & Manufacturing Co., has been formed by former officials of

JOHN MUNRO

T. J. HOWARD

Buda Engine & Equipment Co., Inc., subsidiary of Allis-Chalmers Manufacturing Co. The new organization will take over exclusive distribution of Allis-Chalmers and Buda engines in South Texas. Main office is in Houston with a branch in Alice.

Officers of the new corporation are John Munro, president; Thomas J. Howard, vice president and sales manager; A. H. Benson, general service manager; and W. C. Dvorak, secretary-treasurer. Kirk Rote is sales engineer and Charles Cripps is parts manager at Houston. R. W. Hays is the new store manager and Arno Schubert the new parts manager at Alice.

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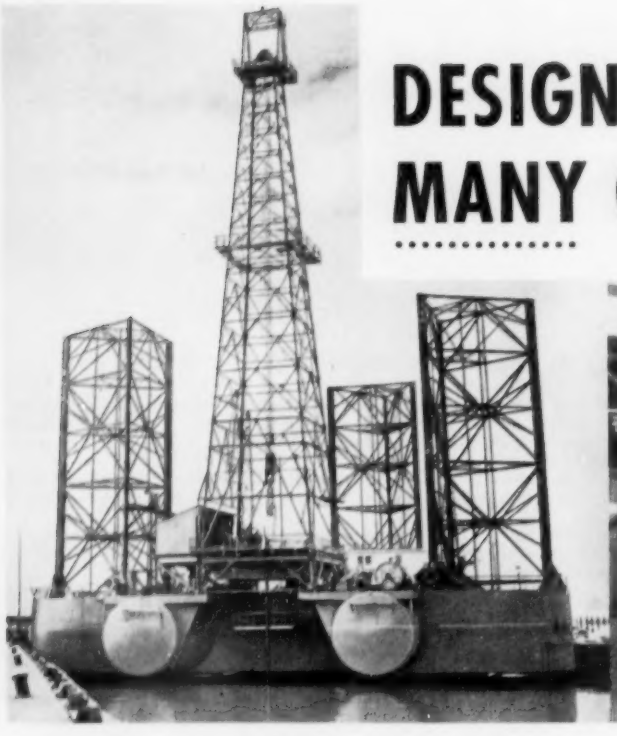
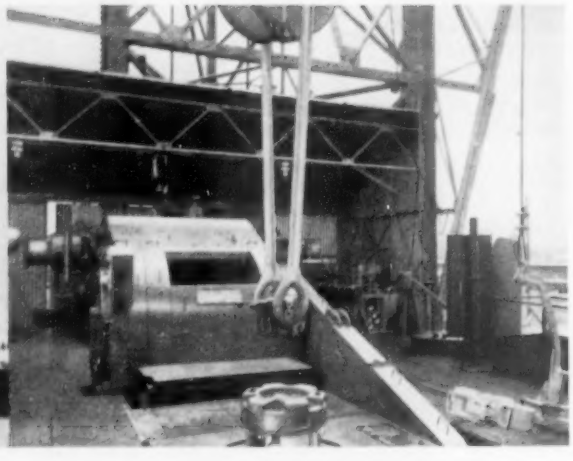
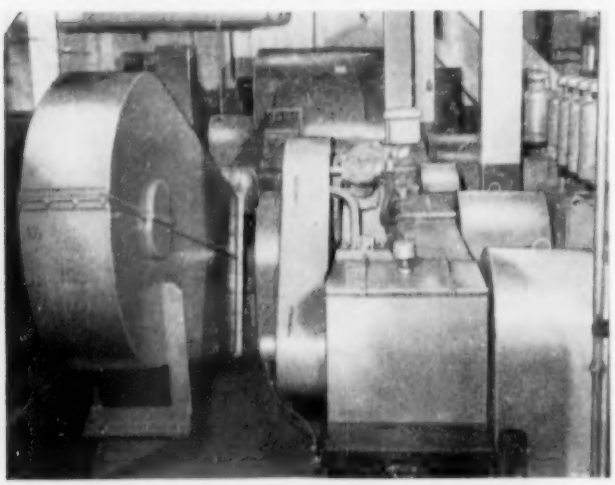
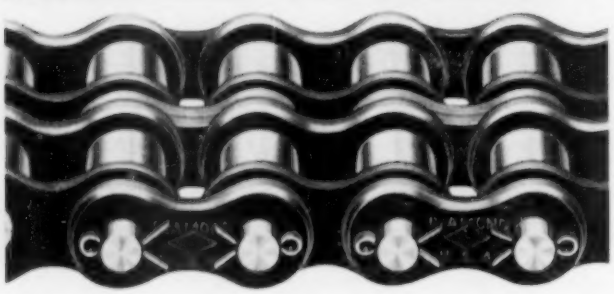




"Oilwell" No. 52T and No. 96 Rigs aboard this unique portable platform are equipped with Diamond Roller Chains





Long range maintenance is a vital factor on this mammoth new portable platform being readied for work in the Gulf by Zapata Off-Shore Company.

The mud pump and power transmission drives are Diamond Roller Chains—known for their high uniform quality and ability to deliver long-life trouble-free performance under the most severe conditions.

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DIAMOND ROLLER CHAINS

South Texas Racks Up a Big One

by Frank J. Gardner

EXACTLY 2 years ago, under the title "Southwest Texas—Still More Oil . . . Mañana," this column pointed a prophetic finger at ". . . (1) the untold possibilities of the Lower Cretaceous yet to be revealed, especially in the Glen Rose and Edwards; (2) the probability of a great expansion of productive trends in the interior of the Rio Grande embayment; and (3) the Paleozoic promise of the Edwards Plateau country."

A flush discovery . . . These possibilities and probabilities have been slowly materializing, but since August 1, they have finally burst upon the heads of South Texas oil men in full force. Testing began on that date at Lone Star Producing Co.'s Atascosa County wildcat, the 1-A Urbanczyk, in F. M. Hunt Survey 149, near Fashing, Tex. (A on map). The final tests were run during the past week and the operator reports a gas-condensate discovery rated at 36 million cubic feet of gas plus 855 bbl. of liquids per day, open flow.

The wildcat was drilled on a 1,200-acre block assembled by M. B. Rudman and H. H. Howell et al and turned to Lone Star as part of its 3,500-acre holdings in the immediate vicinity of the well. Rudman and Howell et al retained an interest totaling a little more than one-eighth. On May 29, Lone Star spudded the test; on August 1, it was down to total depth of 10,921 ft. and had cored 580 ft. of good to fair porosity and 69 ft. of poor porosity in the Edwards-Lower Cretaceous limestone, topped at 10,210 ft. (ground elevation 399 ft.).

After half a dozen drill-stem tests of various intervals within the Edwards section, the operators made final completion through perforations at 10,790-10,816 ft. and 10,824-50 ft. and South Texas gained its best new discovery in a decade. The impressive open-flow capacity of the strike was supported by shut-in bottom-hole pressure of 5,177 psi. and shut-in tubing pressure of 3,986 psi.

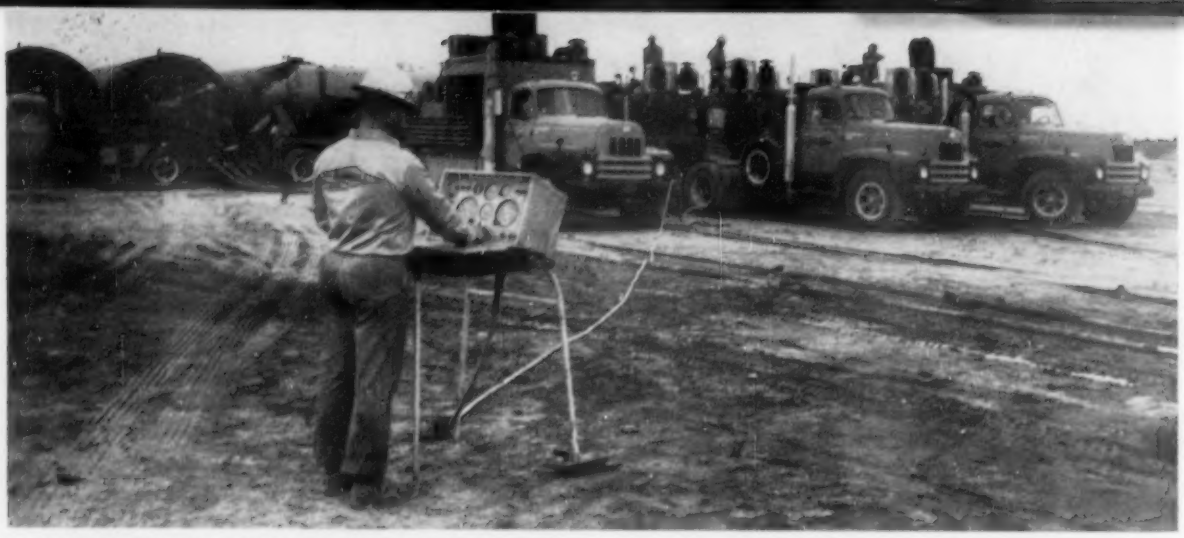
Lone Star figures that 1,000 acres of reservoir rock similar to that found in the discovery would assure a 400-billion-cubic-foot reserve plus about 8 million barrels of liquids. It has now started the first confirmation test at its 1-A Tom, 3,000 ft. southwest of the discovery, in John Benson Survey A-72. It will be closely watched as an important indicator of just what has been uncorked here. Other tests in the area are in the planning stage, and lease plays have been ignited all along the "deep Edwards" trend.

FIELDS PRODUCING from the Edwards limestone are shown here in three definite trends: the Luling-Darst Creek group, the Atascosa County group, and the new "deep Edwards" gas trend in La Salle-McMullen counties. The last-named has received a 30-mile extension at A in a well drilled by Lone Star Producing Co.

Along a vast new trend . . . It is this trend that looms big in South Texas' future, and it is this 30-mile extension to the trend that emphasizes its bigness. It all began at San Miguel field (B on map) in McMullen County in October 1953, when Humble Oil & Refining Co. found South Texas' first deep Edwards gas production at 10,150 ft. At D on the map, Stanolind Oil & Gas Co. established the southern terminus of the trend in February 1954 at Stuart City field, 60 miles southwest of San Miguel and largest of the Edwards fields so far. Other discoveries were made at Syndicate, Southeast Dilworth, and South Tilden (C on map) and most recently at Cooke and Hayes fields (E on map).

There's a lot of room to play in this vast siesta land, and the undiscovered oil, gas, and condensate that lurk in the Lower Cretaceous rocks south of the main Balcones fault system is probably greater than anyone has ever

(Continued on page 175)



SUCCESS OF RECENT high-injection-rate Riverfrac treatments, like this one near Kermit, Tex., is attributed to the salt-dissolving action of the fresh water used as fracturing fluid. Fig. 1.

Fresh-Water Fracturing—Bane or Boon?

Expected troubles haven't materialized, and most results are favorable

by R. E. Hurst

MUCH interest has been centered recently in new fracturing treatments with unthickened fresh water and sand forced into formations at high injection rates.

- This process first came into general use in the San Juan basin, where it was termed Riverfrac.*
- The technique was developed to reduce increased fracturing costs caused by the trend toward higher injection rates and larger quantities of fracturing materials.
- The success of Riverfrac in hundreds of gas wells in the San Juan basin led to its use also in the Permian basin, where it has proved highly effective.
- Part of its effectiveness in these areas now appears to be the result of dissolving of salt from the flow channels of the formation.

Many operators have been cautious about using water in fracturing treatments because they fear it might damage pay formations. It is known that swelling of silicate particles in contact with water may partially counteract the increased permeability resulting from fracturing treatments. The use of water may also result in lost production caused by emulsions or water blocks in the formation.

Therefore, fracturing treatments with water, although cheaper than treatments with oil-base fluids, might be less effective. However, results of a large number of treatments have shown that fracturing treatments with water have resulted in greater production increases than treatments with oil-base fracturing fluids. Considerable study of field and laboratory research data indicates these somewhat surprising results may be due to the removal of salt deposits from the flow channels of the formation.

Presence of salt . . . Considerable amounts of salt are present in most reservoirs of basin origin. This salt may be channel-filling material, or crystals interbedded in the sand or limestone matrix. Apparently, in such reservoirs, fracturing treatments using fresh water improve permeability by dissolving and removing salt.

Data on a large number of fresh-water treatments are available. Tests of the salt content of the fracturing water returned after treatments show clearly that salt has been removed from the formation.

For example, a Permian basin well producing from the Yates sandstone was treated with 680 bbl. of water. First, 480 bbl. of water containing 20,000 lb. of sand was pumped into the formation. This was followed by an 80-bbl. flush and a 120-bbl. overflush. A total of 600 bbl. of water entered the formation. The well had produced no water before treatment, and, after the treating fluid was returned to the well bore, no measurable volume of formation water was produced.

It was impossible to measure exactly the quantity of returned water because the well began producing oil at a high rate. However, an estimated 500 bbl. of water returned. Tests showed that this water was salt saturated. It was calculated that this quantity of saturated water represented the removal of about 54,500 lb. of salt from the formation. (Ed. Note: Saturated salt water at 68° F. holds 109 lb. of salt per bbl.)

For comparison, the increased permeability brought about by the removal of this amount of salt is equivalent to the permeability increase provided by removing 68,000 lb. of limestone during an acidizing treatment. Such a treatment would require 36,000 gal. of 15 per cent hydrochloric acid.

Better than oil . . . The effectiveness of Riverfrac treatments can be seen in comparison with treatments using oil-base fluids. Table 1 compares results from both types of treatments on San Juan basin gas wells in the Point Lookout formation. The table shows the type of treatment, the amounts of fluid and sand used, and the production of wells before and after treatment. It can be seen that the average produc-

*Service mark of Dowell Incorporated.

Author is with Dowell Incorporated, Midland, Tex.

PRODUCING

TABLE 1
Comparative Gas-Production Data Before and After Treatments with Oil and with Water in Point Lookout Formation, San Juan Basin.

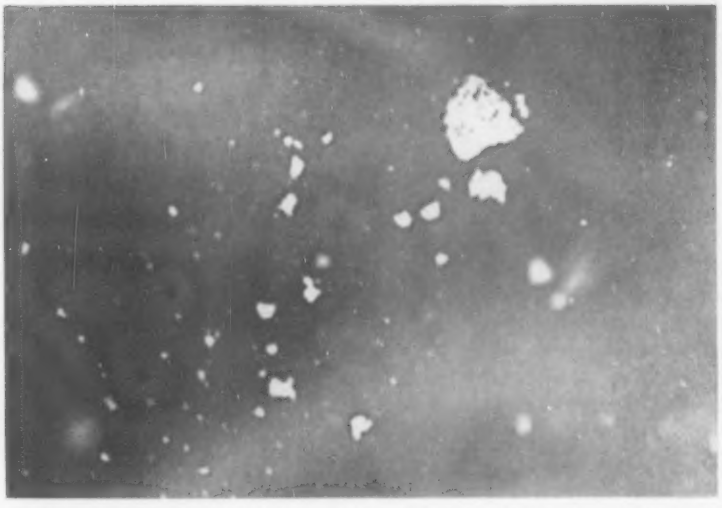
Well	Fluid	1,000 gal. fluid per 1,000 lb. sand	Production, M.c.f. per day — Before	After
1	Water	20/40	975	5,400
2	Water	40/30	36	5,342
3	Water	30/30	500	4,500
4	Water	50/50	100	10,000
5	Water	50/47	No test	1,000
6	Water	33/30		886
7	Water	46/50		8,190
8	Water	40/60		3,125
9	Water	50/0		6,250
10	Water	50/0		1,163
11	Water	50/0	100	15,000
12	Water	50/0	1,000	12,000
				*6,071
13	Oil	20/15	166	3,182
14	Oil	30/50	710	2,100
15	Oil	10/10	248	1,300
16	Oil	10/10	44	2,570
17	Oil	10/10	710	1,950
18	Oil	20/20	759	2,160
19	Oil	17/17	No test	4,380
20	Oil	21/20	No test	187
21	Oil	21/21	100	3,000
22	Oil	22/30	30	4,050
23	Oil	20/20	2,907	4,770
24	Oil	30/30	194	5,788
				†2,953

*Water average. †Oil average.

tion after water treatment was higher than the average production after oil treatment.

Similar data on fracturing treatments on oil wells in four pools is given in Table 2. The wells in each pool are grouped in location and are typical field wells. The size of the treatment in gallons of fluid and pounds of sand is also given. Here again the use of water gave a more effective treatment.

Water treatments are less expensive than treatments with other fluids because of lower material costs. Another economic advantage of water fracturing is the low friction loss in pumping because of the low viscosity of water.

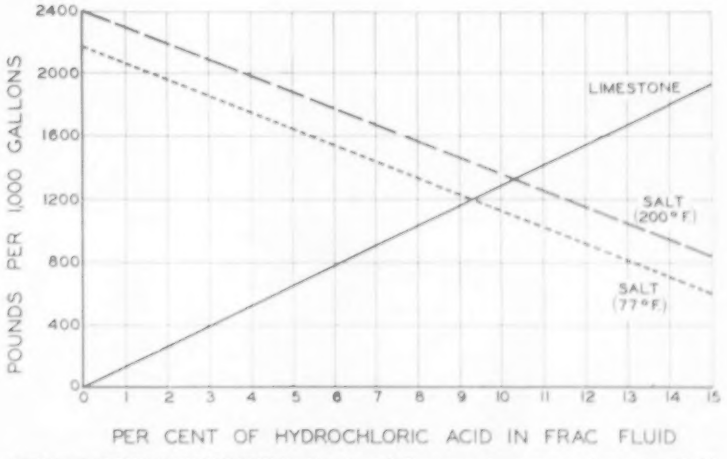


PHOTOMICROGRAPH (130X) shows salt crystals suspended in San Andres crude from South Cowden pool, containing 785 lb. of salt per 1,000 gal. Fig. 3.

TABLE 2—COMPARATIVE OIL PRODUCTION BEFORE AND AFTER TREATMENTS WITH REFINED OIL AND WITH WATER

Pool and formation—	Fluid	1,000 gal. fluid per 1,000 lb. sand	Production (B.O.P.D.)— Before	After
Shafter Lake:				
Yates	Water	20/20	2	88
Yates	Water	20/20	7	32
Yates	Refined oil	10/10	5 (est.)	20
Yates	Water	20/20	0	92
Yates	Water	20/20	2	60
Foster:				
San Andres	Water	30/30	6	73
San Andres	Refined oil	20/40	4	66
San Andres	Refined oil	20/40	5	55
San Andres	Refined oil	20/40	3	50
McCamey:				
Grayburg	Water	90/90	1	40
Grayburg	Refined oil	10/20	2	14
Grayburg	Refined oil	5/8	1	1
Grayburg	Refined oil	20/30	2	18
Spraberry:				
Spraberry	Water	40/47	0	148
Spraberry	Refined oil	21/32	14	137
Spraberry	Refined oil	21/32	29	172
Spraberry	Refined oil	21/30	16	60
Spraberry	Refined oil	21/31	0	125
Spraberry	Refined oil	30/40	8	26
Spraberry	Refined oil	21/32	13	198

Note: Wells compared in each field are grouped in location and are typical field wells.



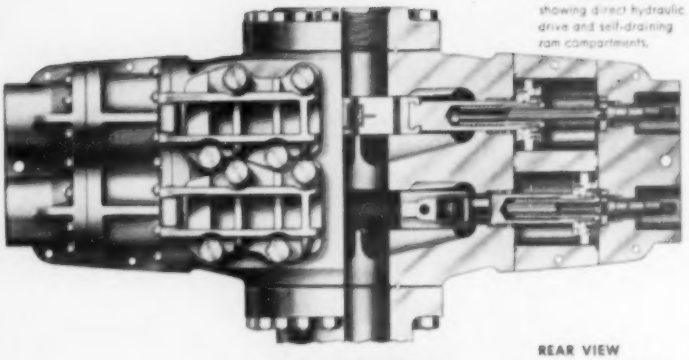
COMPARATIVE SOLUBILITIES of salt and limestone in aqueous fracturing fluids containing various concentrations of hydrochloric acid. Fig. 2.

This results in more efficient use of pumping horsepower, and reduced costs to the operator.

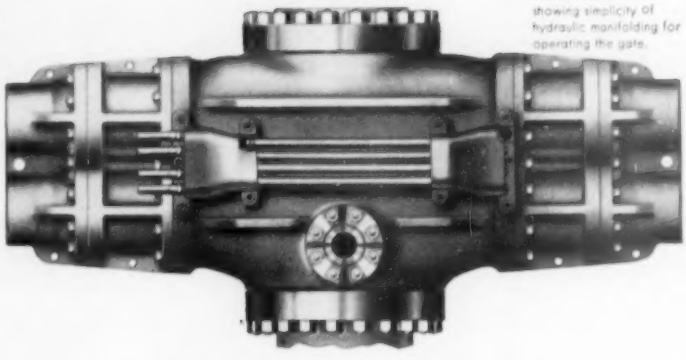
Choice of water . . . Produced salt water rather than fresh water is often suggested as a fracturing fluid because of the reduced likelihood of emulsions occurring in the formation. However, two factors suggest that fresh water is preferable. First, it is thought that the greater salt-dissolving capacity of fresh water makes it a more effective fracturing fluid. Second, when small volumes of water are produced, the salt content approaches saturation.

In wells which produced large volumes of water, the salt content was low. This would indicate that waters with high salt content are produced from

The Cellar Control Gate Features you WANT— *YOU GET* from SHAFFER!



CUTAWAY VIEW
showing direct hydraulic drive and self-draining ram compartments.

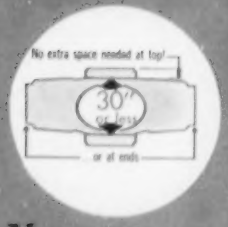


REAR VIEW
showing simplicity of hydraulic manifolding for operating the gate.

Before you make your next investment in cellar control gates, take a moment to think through the various features you would like to have in those gates. You want protection, of course, but protection alone is only *part* of the story. You want such other important advantages as *Compactness . . . Simplicity of Ram Changes . . . Minimum Maintenance . . . Maximum Versatility* . . . and many others.

Then check ANY cellar control gate against the *multiple* advantages you get in Shaffer Hydraulic Cellar Control Gates and you'll see why Shaffer Gates are the top choice of leading operators throughout the oil industry. No other equipment offers *so many* design and performance features—in such a compact "package" as do Shaffer Hydraulic Gates.

For Example . . .



You get

USEABLE COMPACTNESS!

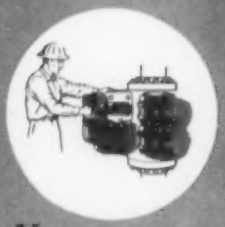
To begin with, Shaffer Hydraulic Gates are amazingly compact in all three dimensions—height, width and length. Even in sizes as large as 13⅝" (12" Series 900) Shaffer Hydraulic Double Gates require only 30" total height—Single Gates 18½".

In addition, there's no need to allow extra space above or at the ends in order to change rams, because Shaffer's exclusive side-opening doors through which the rams are changed open on the dimension where there's plenty of room. Thus, Shaffer's compactness is completely useable compactness!

You get

SINGLE or DOUBLE DESIGN

Some operators prefer Double Gates (two ram compartments unitized into one body) for their greater compactness in a multiple gate hookup. Others prefer the extra flexibility of Single Gates (use them singly . . . in pairs . . . or with a Double Gate for three-way protection). From Shaffer you get what YOU prefer—Double or Single—with both designs offering the same basic operating and construction features!



You get

EASY RAM CHANGES

To meet requirements of varying pipe sizes as wells are drilled, the rams must be changed frequently. Shaffer Gates are unsurpassed in the ease with which the rams can be changed. Simply unbolt and open doors in the side of the gate body, slide out the ram assembly, change rams, slide the assembly back in place and bolt the doors shut. It's that simple.

What's more, rams can be changed with equal ease whether the pipe is in or out of the hole!

You get

SELF-DRAINING COMPARTMENTS

You want a gate where no detrimental mud or sand can accumulate to interfere with free ram travel—and Shaffer gives you this advantage, too. Note how the rams travel on guide ribs high above the steeply-sloped gate bottoms. Mud and sand quickly drain back into the well. Also, since well pressure is free to flow to the back of the rams, it actually assists in the closing and sealing action!

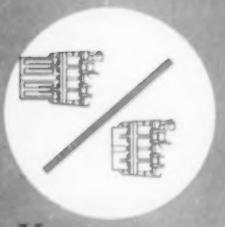


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TABLE 3
Average Salt Content of Produced Water (Permian Basin)

Formation—	Lb. per 1,000 bbl. water
Yates (7)	45,840
Grayburg (1)	11,300
San Andres (18)	41,518
Clear Fork (13)	54,750
Glorietta (1)	54,900
McKee (2)	33,000
Spraberry (1)	42,300
Delaware (4)	50,540
Tubbs (2)	48,500
Wolfcamp (1)	55,000
Fusselman (2)	51,000
Holt (2)	38,850
Devonian (6)	32,294
Pennsylvanian (2)	47,600
Silurian (4)	35,875
Ellenburger (8)	27,570

within the oil section or from flooding waters, while waters with low salt content are from a level other than the oil-bearing strata.

Therefore, if the produced brine came from the formation and was highly saturated with salt, fresh water would be more effective than brine. If the produced brine had a low salt content, it would not be from the oil-producing strata and therefore would be no safer from the emulsion standpoint than fresh water.

Salt dissolved . . . The high concentration of salt in waters produced from Permian basin formations in a number of pools is shown in Table 3. This table gives the average salt content per thousand barrels of produced waters. The figures in parenthesis following each formation give the number of pools from which samples were taken. Two samples were analyzed from each pool.

Fresh water has greater salt-dissolving capacity than hydrochloric acid. However, a small amount of hydrochloric acid may be desirable for most limestone reservoirs and some sandstone reservoirs. The acid dissolves any limy material surrounding salt deposits so that water can remove the salt.

For mose limestone and limy sandstone reservoirs, the acid concentration should be in the range of 2 to 5 per cent. Fig. 2 shows the amount of calcium carbonate and the amount of salt that can be dissolved by each 1,000 gal. of treating fluid injected during fracturing treatments. It can be seen that stronger concentrations of acid reduce the quantity of salt that can be dissolved by the fluid, while increasing the amount of calcium carbonate which can be dissolved. In the concentrations from 2 to 5 per cent, the best and most effective compromise can be found. These concentrations will remove lime deposits and yet remain capable of dissolving large quantities of salt.

Application . . . The suitability of Riverfrac for a particular formation can often be determined by laboratory tests. The greatest benefit would be expected in formations containing large amounts of salt. It is difficult to determine salt content from cores because few of them are available which are not contaminated or washed out by aqueous drilling fluids. However, analysis of produced oils indicates a formation's salt content.

For example, Table 4 shows the gravity and salt content of produced oils from 16 different formations, in many pools. The salt dome was in the form of undissolved crystals suspended in the oil, and its quantity determined by electrometric titration. Fig. 3 is a photomicrograph showing salt crystals in an oil produced from the San Andres formation.

Laboratory tests will often reveal formation conditions requiring special precautions to avoid silicate swelling or emulsion difficulties. Many formations have been tested this way.

South-Cowden Grayburg, Shafter-Lake Yates, North Mason Delaware, Goldsmith Glorietta, Headlee Devonian, Spraberry San Andres, and the McElroy Grayburg showed only slight swelling in the presence of fresh water and the formation oils did not show emulsion-forming characteristics. The East Goldsmith Holt, East Goldsmith San Andres, Means Queens, Prentice Clear Fork, Spraberry Spraberry, and Wheat Delaware showed only slight swelling and did not form emulsions when a suitable demulsifying agent was added to the treating water.

Only the Farmer San Andres showed excessive swelling and probably should not be exposed to water.

An evaluation of field and laboratory data showed the use of fresh water as a fracturing fluid not only reduces costs, but actually provides increased stimulation. Silicate swelling and emulsion difficulties have not materialized as anticipated by many operators. From all indications, the success of water as a fracturing fluid results from its dissolving action in removing salt deposits from the flow channels of the producing formation, thereby increasing production.

Table 4—Average Salt Content of Produced Oil (lb. per 1,000 bbl.)

Formation and pool—	Oil gravity (deg.)	Salt content
Yates:		
Spencer	32.5	401.0
Holley	31.9	65.6
Kermit	38.0	160.0
Emperor	32.2	780.0
Hendricks	23.0	665.0
North Ward-Estes	33.5	454.0
South Ward	34.7	473.0
Grayburg:		
Fuhrman Mascho	33.0	137.0
San Andres:		
South Cowden	34.2	785.0
Welch	33.3	966.0
Adair	41.3	10.0
Cedar Lake	28.8	1,007.0
Fuhrman Mascho	32.6	127.0
Martin	36.0	452.0
Slaughter	30.3	493.0
Levelland	31.3	370.0
Littlefield	29.4	123.0
Andector	36.2	164.0
Donnolly	36.4	514.0
Foster	34.9	781.0
Johnson	33.5	790.0
Harper	35.7	629.0
Brahaney	27.7	432.0
North Cowden	29.6	514.0
Goldsmith	33.8	30.0
Wasson	30.8	493.0
Clear Fork:		
Spraberry	36.0	79.8
Dollarhide		884.0
Sealy-Smith	35.8	637.0
Martin	40.8	61.8
Antem-Irish	28.3	255.0
Andector	36.2	135.0
TXL	28.0	132.0
Donnolly	33.7	452.0
Lee Harrison	24.4	155.0
Smyer	24.6	164.0
Prentice	26.8	197.0
Clear Fork (lower):		
Goldsmith	39.8	185.0
Clear Fork (upper):		
Goldsmith	36.0	267.0
Glorietta:		
Prentice	28.5	411.0
McKee:		
Keystone	71.0	16.5
Goldsmith	41.1	62.0
Spraberry:		
Spraberry	38.8	2.1
Delaware:		
Mason	41.6	9.5
North Mason	40.1	18.1
Tunstill	39.0	7.2
Wheat	38.3	4.2
Tubbs No. 3:		
Sealy Smith	35.9	123.0
Tubbs No. 1:		
Sealy Smith	61.5	57.5
Wolfcamp:		
Block 9	36.6	12.9
Fusselman:		
Sealy Smith	39.9	36.0
Goldsmith	42.0	36.0
Holt:		
Keystone	40.5	316.0
Goldsmith	38.2	505.0
Devonian:		
Dollarhide	38.4	88.1
Wheeler	34.6	78.3
Block 9	43.4	246.0
Yarbough Allan	35.2	82.0
TXL	37.0	56.0
North Goldsmith	40.2	3.7
Pennsylvanian:		
Block 9	36.2	4.5
Dora Roberts	42.7	5.9
Silurian:		
Dollarhide	39.2	313.0
Wheeler	30.2	10.2
Keystone	35.1	136.0
Andector	34.9	23.0
Ellenburger:		
Dora Roberts	52.1	14.9
Wheeler	41.4	222.0
Keystone	40.2	189.0
Martin	42.3	452.0
Sealy Smith	46.0	299.0
Dollarhide	39.3	337.0
Yarbough Allan	40.2	25.0
Goldsmith	43.5	399.0

ROCKIES GIRD FOR FALL ROUNDUP

by John C. McCaslin
District Editor

NEW pay zones, new oil and gas fields, falling wildcat barriers, and new drilling records make the Rocky Mountain region one of the country's most colorful and successful oil provinces. Drilling activity remains steady throughout the province's oil-hunting grounds with very little trouble as a result of the recent steel crisis. At mid-August 274 rotary rigs were humming from the Four Corners region to east-side Williston, preparing the way for more record drilling during the last quarter of 1956.

Four Corners lead . . . Despite the widespread drilling tempo in the Rockies, the Four Corners region of the Paradox and San Juan basins in northwestern New Mexico, and neighboring northeastern Arizona, and southeastern Utah still plays the leading role in regional drilling activity.

The Paradox and San Juan basins are proving themselves to be two of the nation's most promising future oil provinces. The success at Aneth and Bisti-Black Rock are a credit to those who seek new oil reserves in wide open wildcat country. The Paradox basin, one of the country's biggest new-producing basins in area, at first seemed doomed to barrenness.

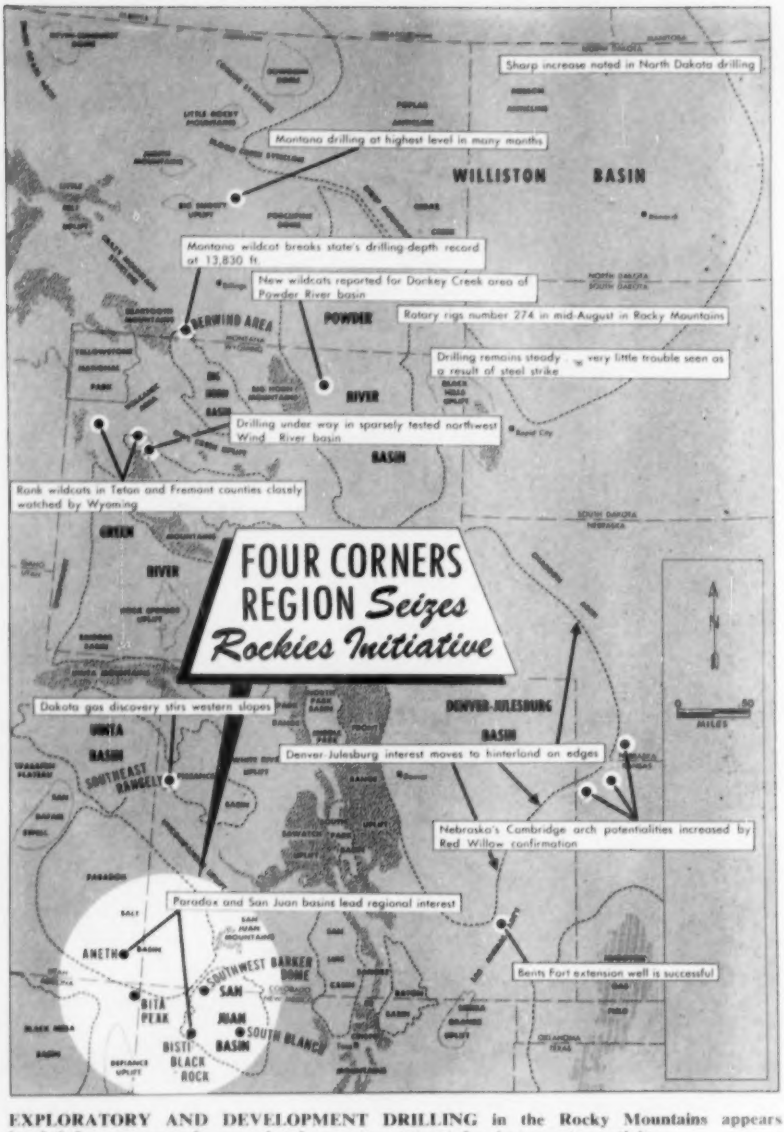
Then came Aneth with its 1,500-bbl. per day producers. The Aneth area now has 10 producers. Late this summer The Texas Co. added a 3-mile extension on the field's northwest side. There had been no previous drilling between this 436-bbl. per day discovery and the field proper. This discovery also raised hopes of a connection between Aneth and Shell's Bluff-unit test, not yet completed.

Although Utah has the biggest bite of Paradox basin success, northwestern New Mexico, and Arizona's northeast corner also claim rewards. Humble Oil & Refining Co. opened a Pennsylvanian reservoir in San Juan County, New Mexico, and is now drilling a confirmation try. The latest wildcat excitement in the region is El Paso Natural Gas Co.'s Bita Peak prospect in Apache County, Arizona. Nearest production to this Pennsylvanian strike is 6 miles northeast at Humble's New Mexico discovery.

. . . San Juan and Bisti-Black Rock. The San Juan basin has entered a new oil era as a result of the tremendous success registered at Bisti-Black Rock Gallup sand pool in San Juan County, New Mexico.

The field is now the most important oil-producing area in the entire basin. There were more than 30 oil wells completed by the end of August with an equal number of locations staked, active, or nearing completion.

The Bisti-Black Rock success stirred up a series of wildcats throughout the immediate San Juan basin area. Amerada Petroleum Corp. completed its 5-A Jicarilla-Apache as the first Gallup sand producer in the South Blanco area—the easternmost such production in the basin. Nearest oil production to the Amerada well is 12 miles northwest in South Blanco-Tocito pool. Gulf Oil Corp. also added more honors to Gallup sand fame at a shallow Tocito sand well in Southwest Barker dome, San Juan County. The oil strike moved field production 3 miles southwest. The Tocito,


Sharp increase noted in North Dakota drilling
Montana drilling at highest level in many months
WILLISTON BASIN
Montana wildcat breaks state's drilling depth record at 13,830 ft
New wildcats reported for Donkey Creek area of Powder River basin
BERWIND AREA
POWDER
Rotary rigs number 274 in mid-August in Rocky Mountains
Drilling remains steady as a result of steel strike — very little trouble seen as
RIVER
Drilling under way in sparsely tested northwest Wind River basin
BASIN
Rank wildcats in Teton and Fremont counties closely watched by Wyoming
FOUR CORNERS REGION Seizes Rockies Initiative
Dakota gas discovery stirs western slopes
UINTA BASIN
SOUTHEAST RANGELY
DENVER-JULESBURG BASIN
Denver-Julesburg interest moves to hinterland on edges
Nebraska's Cambridge arch potentialities increased by Red Willow confirmation
Paradox and San Juan basins lead regional interest
ANETH
SOUTHWEST BARKER DOME
BITA PEAK
SAN JUAN BASIN
SOUTH BLANCO
BISTI BLACK ROCK
Bents Fort extension well is successful
A N E
0 50
MILES

EXPLORATORY AND DEVELOPMENT DRILLING in the Rocky Mountains appears headed for new records as regional operators get set for last quarter activity.

or its Gallup equivalent, is in line for real examination east-west across the San Juan basin in the coming exploratory weeks.

Western slopes close behind . . . Increased drilling is due the western slopes of Colorado as a result of the Southeast Rangely Dakota gas discovery in Rio Blanco County.

G. E. Kadane's discovery well was completed for 10,000 M.c.f. of gas per day. Location is 4 miles southeast of big Rangely field and 4 miles north of gas production in Douglas Creek field. Kadane's well was a Weber-Pennsylvanian attempt, but he went back to complete in the Dakota. Weber sand possibilities have been on the upgrade in wildcat interest in recent months since the North Douglas Creek Weber discovery last winter. Phillips Petroleum Co. has added further fire with announcement of a 17,000-ft. record-breaker in Rio Blanco County's Powell Park area, west of Meeker. This one should be watched.

Western Colorado is fast becoming the focal point of state drilling activity. There is a definite shift to the western counties of the state, while the Denver-Julesburg basin activity in eastern Colorado has declined or moved into the fringe wildcat areas on the far east and southeast part of the basin. Considerable drilling is noted in La Plata, Rio Blanco, Garfield, Moffat, and Mesa counties in western Colorado. A significant recent discovery in this region is the Salt Wash gas strike in Mesa County which flowed 6,160 M.c.f. per day, 2 miles west of Highline Canal, a Dakota 1951 discovery.

. . . Canadian River. One of Colorado's exploratory highlights of 1956, and indeed for the entire Rocky Mountain region, is Cabeen Exploration Co.'s Jackson County Canadian River field discovery in the North Park basin; a long-neglected future oil province of possible importance.

Cabeen's 1 Blevins, the field discovery well, finaled flowing 6,000 M.c.f. of gas per day from the Muddy sand. The confirmation well, 2 Blevins, was completed for 21,000 M.c.f. of gas per day in both the Dakota and Lakota, adding two new pays to the field. Now Cabeen has an oil well at 2-B Blevins, flowing at the rate of 118 bbl. per day on 24/64-in. choke from Lakota sand. With five field wells slated, this Colorado area bears a close look this fall and winter.

Montana drilling high . . . Most of the 47 rigs now working in Montana are busy searching real wildcat country—the Sweetgrass arch, Central Montana Plains, and off the flanks of the Cedar Creek anticline. Field-development drilling is centered on the Sweetgrass arch's fields, East Poplar, and along the Cedar Creek anticline. The state is headed for new completion and production records in 1956.

One outstanding wildcat in Carbon County's Berwind unit area went to 13,830 ft. to set a new drilling-depth record for the state. This was Phillips Petroleum Co. 1 Northern Pacific in the northern part of the Big Horn basin. The previous depth-record well was in Richland County's Sidney area, Williston basin.

North Dakota interest rises . . . Late in August, 18 new locations were announced for scattered areas of North Dakota, 5 of them wildcats. Deep tests are slated for Beaver Lodge field on the Nesson anticline. Other wildcats will look for oil in the area between and up to the east side of the Williston basin. Development drilling at new Big Antelope field on the Nesson anticline, one of North Dakota's most significant recent discoveries, may prove to be the state's drilling highlight of the year.

What's coming up . . . Here are the areas that will be in the wildcat news during the remaining 4 months of 1956:

. . . Keep an eye on the mushrooming Gallup sand play in the San Juan basin. Bisti-Black Rock will be the discovery and development story of the year in the entire Rockies.

. . . How far will the Aneth trend go in southeastern Utah? This question may be answered in the next few weeks. Bluff unit may be the key.

. . . Bita Peak may become Arizona's second producing area. Success here and a confirmation to Humble's San Juan County, New Mexico Pennsylvanian discovery will go a long way toward proving the potentialities of the Paradox basin's southern rim.

. . . Phillips' deep test in northwestern Colorado should not only set a new drilling-depth record for Colorado, but also uncover some interesting exploratory vistas to spur the coming deep-drilling program in the Rangely area.

. . . Successful extension of Bents Fort field in the Las Animas arch area of southeastern Colorado is sure to give birth to more Pennsylvanian tries in this region.

. . . The Cambridge and Chadron arches of Nebraska will be probed more and more as a result of Red Willow County's discovery and confirmation. Success across the line in Kansas, Decatur, Rawlins, Thomas, and Wallace counties further enhances this virgin wildcat country's possibilities.

. . . Concentrated wildcat tests on Williston's eastside will command United States Williston interest.

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EXPLORATION HIGHLIGHTS

EASTERN INTERIOR

ILLINOIS

Dry Holes Equal Producers at Arcola

There were nine new producers in the Cooks Mills-Arcola-Bourbon field area of Coles and Douglas counties. There were also nine dry holes completed during the period. Four new producers were reported at Cooks Mills, three at Arcola, and two in Bourbon field.

Fast progress is being made by Ashland Oil & Refining Co. on the installation of the pipeline gathering system in the Quinn Chapel and Arcola production areas. Oil will be collected in part of the system within a few days. The main line of the gathering system from Cooks Mills station to the Coles-Douglas County line has been completed. A 1,500-bbl. gathering tank is going up on the Ed Hill farm southwest of Arcola. Two large tanks north of Cooks Mills, where the company will tap the main transmission line of the Texas Cities Pipe Line Co., are nearing completion.

MID-CONTINENT

OKLAHOMA

Criner Field Well Is Dual Producer

A field well in Criner field, McClain County, south-central Oklahoma, flowed 2,328 bbl. of oil per day with 1,100 M.c.f. of gas from perforations in the Bromide sand at 10,050-10,195 ft. From the Hunton lime at 8,970-9,000 ft. the well made 528 bbl. with 312 M.c.f. per day. This big producer is Gulf Oil Corp. 1 Baxter, NW SE 20-6n-3w.

West Cement Area Has Four Pay Zones

Amerada Petroleum Corp. has uncovered four producing sands in three drilling tries at West Cement, Caddo County. The newest addition is the Rowe sand found at 1 Leazenby, NW SE SE 19-6n-10w. This well flowed 6,640 M.c.f. of gas per day from 5,692-5,760 ft. The discovery well found Wade and Marchand gas production. The 1 Gish well got oil in the Medrano sand.

Plans for Field Trip Announced

The Oklahoma City Geological Society will hold a field conference September 20-22. Theme of the conference will be a study of the Paleozoic rocks outcropping in the mountains of south-central Colorado and their relationship to comparable units in the northwestern Anadarko basin.

The first day of the trip, September 20, will be spent in the Oklahoma Panhandle, Dry Cimarron Canyon, and the eastern Raton basin, with headquarters for the night at Raton. The second day, Friday, September 21, the conference will traverse the Raton basin by way of Tercio Dome, across Cucharas Pass to La Veta, thence westward to study the Paleozoic section at La Veta Pass. The conference will then travel eastward to examine the structure and stratigraphy of the Apishipa uplift, thence to Pueblo for the night.

The third day, Saturday, September 22, will be spent examining the stratigraphic and structural relationships in the vicinity of Beulah and Rye, the Canon City Paleozoic section, thence to Colorado Springs for additional study of the Paleozoic section including the Glen Eyrie. The conference will disband in Colorado Springs on Saturday afternoon.

The conference will rendezvous at Hotel Dale in Guymon, Okla., September 19. Advanced registration will be honored prior to September 10 by L. J. Beckmann, Champlin Refining Co., Box 1713, Oklahoma City. Registration fee for the trip is $12. This includes the guidebook.

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HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Permian Strike Promises First Greeley Production

Greeley County in western Kansas is in line for its first producing well at Van-Grisso Oil Co.'s 1 Watson, C SE SE 8-20s-39w, 18 miles northwest of the northwestern limits of Hugoton field and Patterson pool of Kearny County.

A drill-stem test in the Permian at 2,782-2,812 ft. recovered a blow of gas and 40 ft. gas-cut mud. The second test at the well at 2,814-37 ft. gaged 150 M.c.f. of gas with recovery of 40 ft. gas-cut mud reported. The last reported test at 2,847-80 ft. gaged 149 M.c.f. per day and recovery of 90 ft. of gas-cut mud was reported.

FIRST PRODUCTION is seen for Greeley County in western Kansas. The discovery well prospect is Van-Grisso Oil Co. 1 Watson, 18 miles northwest of Hugoton field's northwestern limits.

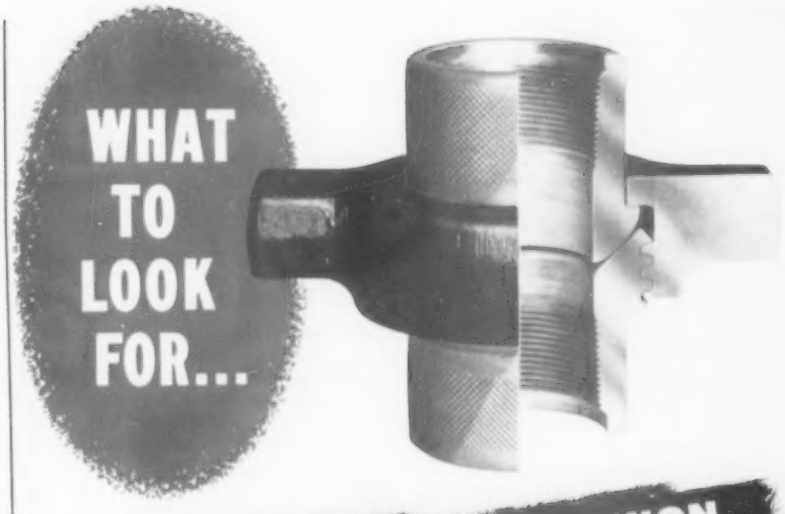
TEXAS PANHANDLE

Hansford Activity Back on Upgrade

Hansford County is back in the exploration success news after many months of comparative quiet in comparison with its neighboring Ochiltree County.

The newest discovery is Shamrock Oil & Gas Corp. 1 Charles O'Loughlin, Jr., a wildcat test 9 miles northeast of Gruver and 8 miles south of Hugoton field production in Section 67, Block 45, H&TC Survey. The well flowed 1,350 M.c.f. of gas per day on a drill-stem test at 5,367-87 ft. Later tests flowed 7,500 M.c.f. per day from 5,326-84 ft. with a distillate spray.

Ochiltree . . . This Texas Panhandle county has eight wildcats drilling and three field wells, the same as Hansford County. There are 27 wildcats



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drilling throughout the entire Texas Panhandle, and 63 field wells. In southwestern Kansas 16 wildcats are under way, four of them in Meade County. There are 49 field wells in the mill. Beaver County leads drilling activity in the Oklahoma Panhandle with 5 wildcats and 12 field wells.

OKLAHOMA PANHANDLE

New Pay Reported at East Forgan Field

Council Grove Permian gas production has been added to East Forgan-Morrow-Penn fields in Beaver County. The discovery well is Carter Oil Co. 1 State-Hodges, SW SW NE 4-5n-24eCM.

A drill-stem test at 3,305-23 ft. got 5,020 M.c.f. of gas per day. This well is the north offset to The Texas Co.'s 1 Gulf Coast Wester-A, which was completed flowing 16,340 M.c.f. of gas per day from perforations at 6,410-32 ft.

Good Gas Well Is Hoover Sand Producer

A rank Hoover sand gas discovery in eastern Beaver County flowed 32,600 M.c.f. of gas per day after fracturing on blowdown test. Cabot Carbon Corp. 1 Barby-B, SE NW SE 31-4n-28eCM, was perforated at 4,318-32 ft.

The closest Hoover sand production is 7 miles east in Harper County's Northwest Laverne field. This Hoover sand discovery in eastern Beaver County raises hopes of a possible continuous Hoover sand trend from Beaver to Harper County.

NORTHWEST OKLAHOMA

New Pay Added to Northeast Laverne Area

An offset well in Harper County's Northeast Laverne field flowed 18,000 M.c.f. of gas per day on test of the Hoover sand at 4,186-4,280 ft. The new strike is Shell Oil Co. 1 Sturgeon Unit in NE NE SW 2-26n-25w, north offset well in the field. This one also had production in both the upper and lower parts of the Chester-Mississippian lime. The Hoover is Pennsylvanian.

APPALACHIAN

OHIO

The Roberson-Beisser 1 Noel Rohehaver, Village of Walhonding, New Castle Township, Coshocton County, filled to the top natural and gaged 411 bbl. in the 24-hour test after fracturing. Clinton sand was reported at 2,980-3,032 ft.

- In the northeast part of Butler Township, Knox County, the C. A. Davis 1 Walter Bardon, Lot 3, a north offset to the 1 Stricker, gaged 50 bbl. and 700,000 cu. ft. gas in 24 hours after fracturing. Clinton was found at 2,976-3,020 ft. with a showing of oil and 110,000 cu. ft. gas natural.

- A ½-mile north extension to Nashport pool was good for 213 bbl. daily after fracture from Clinton at 3,018-48 ft. The completion was by Mutual Oil & Gas Co. on 1 (5) G. Fairall, Lot 3, Licking Township, Muskingum County.

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virgina, Hope Natural Gas Co. 9988 West Virginia wildcat, elevation 3,023 ft., topped the Oriskany sand at 4,847 ft., with gas at 5,017-21 ft., gaging 1,356,000 and is drilling at 5,074 ft.

- Licking district, Tucker County, this company's 9993 E. Fike, elevation 1,921 ft., reached gas in the Oriskany sand at 5,018-21 ft., testing 169,000 cu. ft.

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PESA

● Allen district, Morgan County, Transcontinental Production Co. 1-K-1 Amasa Nestor, shut down for some time, has started up again and is drilling at 3,482 ft.

PENNSYLVANIA

Young Township, Indiana County, Southwest Pennsylvania, Manufacturers Light & Heat Co. 4336 Stewart and R. & P. Coal Co. remains shut down at 7,468 ft. The gas pay in the Oriskany sand was shot and increased to only 127,000 cu. ft.

● Mount Pleasant Township, Westmoreland County, Peoples Natural Gas Co. 4100 Henry E. Leighty is running the 7-in. casing at 8,480 ft.

EASTERN KENTUCKY

A current wildcat test for Pike County, southeastern Kentucky, is that of United Fuel Gas Co. 8466 George W. Litz, estate. Well is located at the mouth of Camp Creek of Knox Creek with an elevation of 872 ft. Mississippian Big lime was topped at 2,238 ft. and operator is currently drilling at 2,252 ft.

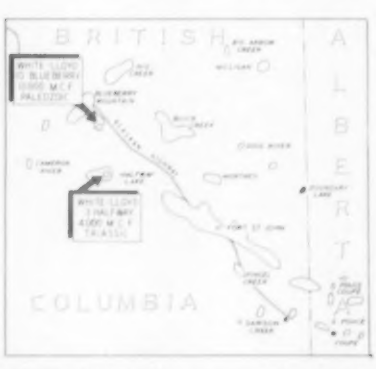
WESTERN CANADA

BRITISH COLUMBIA

Sixth Gas Well Added To Blueberry Area

Gas development drilling continues to climb as J. B. White and A. M. Lloyd completed the sixth gas well in the Blueberry Mountain area of northeastern British Columbia.

The latest addition to the impressive list of new gas producers in this area where 21 rigs are working is the 10 Blueberry Mountain on LSD 7, 9-90-25w6, 3 miles southeast of the No. 2 gas well. The 10 well flowed an estimated 10,000 M.c.f. of gas per day from the Paleozoic dolomite section at 6,793-6,803 ft. The well is coring ahead expecting about 60 ft. more of this section. After more tests of the new section, the well will go on down to the Rundle.



TWENTY-ONE rigs are working in the northeastern British Columbia region seeking additional gas reserves as the province enjoys its busiest drilling program in history. Centers of current drilling interest are Halfway Lake and Blueberry Mountain.

Halfway Lake . . . The same group's 3 Halfway well on LSD 12, 12-88-25w6, 1 mile northwest of the Halfway Lake discovery well, is drilling ahead below 4,100 ft. This well is a Triassic discovery with about 45 ft. of pay sand. This well flowed 4,000 M.c.f. of gas per day at the 3,780-ft. mark.

Tests staked . . . Pacific announced eight new wells for the Fort St. John field. This is just a part of a 60,000,000 dollar program that will see 70 gas wells drilled by Pacific in this region.

SASKATCHEWAN

Oxbow Wildcat Indicates Success

A wholly-owned subsidiary of Anglo American Exploration, Ltd., Gridoil Freehold Leases, Ltd., has indicated commercial oil production at an exploratory test in the Oxbow area of southeastern Saskatchewan. The new strike lies about 7 miles north of Oxbow town and was indicated as an oil success during a pair of drill-stem tests run in the Mission Canyon member of the Mississippian formation.

This well, Gridoil 10-25 Auburnton, on LSD 10, 25-4-2w2, lies 5½ miles west-southwest of Imperial Oil, Ltd.'s 1-2 Auburnton exploratory abandonment and is 4½ miles west-northwest of the Rio-Palmer West Canadian 1 Oxbow abandonment.

Initial test in the discovery horizon, of the interval 4,148-62 ft., gave a pipe recovery of 210 ft. of clean oil and 120 ft. of mud-cut oil while the next test, from 4,156-68 ft., gave up 1,100 ft. of clean, 31°-gravity oil.

Crew has since cored ahead and further drill-stem test in the Mission Canyon is being carried out.

GREAT LAKES

MICHIGAN

Reynolds Reed City Pool Extended

Reynolds Reed City zone-Dundee oil pool, Montcalm County, was extended another ¼-mile southeast during the current period, while one other good producer was under test in pay objective adding two new wells for the week.

The extension producer southeast (one 40-acre location), was Osceola Refining Co. 1 Buck, SE SW NE 18-12n-9w, Winfield Township, which was flowing natural through a restricted choke at an average of 5 bbl. of oil an hour on latest tests. Well is scheduled to be acidized, but production cannot exceed 75 bbl. a day, state-imposed per-well allowable for Reynolds field wells. Dundee top was logged at 3,238 ft. Pay showed at 101 ft. in Dundee, between 3,339-45 ft., total depth. This group will move drilling rig one 40-acre location east to drill 2 Buck well.

Just north of this new producer, Robert Bond & Russell Otterbine added second well on the Lovegran lease about 2 days after 1 Buck well was drilled in. The 2 Lovegran, SE NW NE 18-12n-9w, flowed oil in 28 minutes after pay was logged at 3,336 ft., 101 ft. below Dundee top logged at 3,235 ft.

Reynolds pool now includes 23 Dundee-Reed City zone oil producers and two Traverse oil wells, all drilled on a 40-acre well spacing pattern. North-south length of pool is 3 miles. Field is about 1 mile wide now at its widest point.

ROCKY MOUNTAIN

WYOMING

Westernmost Muddy Oil Found in Powder River

A Newcastle (Muddy) sand oil discovery in the northern Powder River basin is the westernmost such oil in this region. Owanah Oil & Development Co. swabbed 60 bbl. of oil in 13 hours on a test of the Muddy at its 31-1 Federal in the Little Missouri area of Crook County, C SE SE 31-52n-67w. Perforations were at 3,564-68 ft.

This new discovery is about 2 miles west of Moorecroft field, separated by dry holes.

CAMBRIDGE ARCH

Decatur Stepout Recovers Oil in Kansas

The stepout test to Cities Service Oil Co.'s recent 1 Warner discovery in NE NE SW 11-1s-27w, Decatur County, northwestern Kansas, reported recovery of 2,050 ft. of free oil on a 1-hour drill-stem test. The new success on the Cambridge arch flanks is Joe Rothmeier et al 1 Kilzer, SE SE NE 2-1s-27w, Decatur County, Kansas.

This stepout is 1½ miles northeast of the 1 Warner discovery, a Pennsyl-

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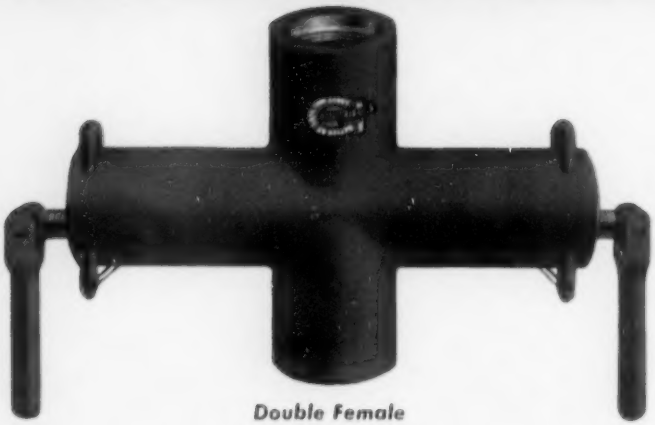
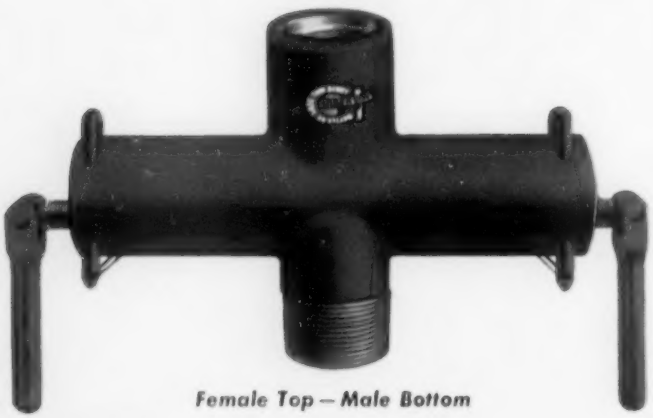


Double Female



Female Top — Male Bottom

Guiberson tubing preventers offer maximum safety, easy operation, low first cost and minimum upkeep. Metal parts are precision-made of high grade materials. The steel ram and rubber packing element are molded integral, the rubber being a special oil resistant, wear resistant compound developed in the Guiberson rubber laboratory especially for oil field use.

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vanian strike. The 1 Warner was completed for 330 bbl. of oil per day from the Lansing-Kansas City. The 1 Kilzer discovery also has Lansing-Kansas City production. Cities Service reports two wells nearing completion just east of their Warner discovery.

ARIZONA

Franco Opens New Gas Field

Franco Western Oil Co. of Bakersfield scored a new gas field discovery in the northeastern part of Arizona. Franco's 1 Gila River tested gas at a rate of 7,450 M.c.f. daily through a ½-in. choke. The perforated interval is 5,359-92 ft. The wildcat, a farmout deal from Shell Oil Co. is located in SW NW 22-41n-28e, in the north Toh-Atin region of Apache County.

SOUTH DAKOTA

Custer County Discovery Apparently Confirmed

South Dakota's second producing area, Helms-Leo pool in Custer County, in the southwestern part of the state, south of the Black Hills, appears to be nearing confirmation. Shallow Rock Exploration Co. 1 Coffing, SE NW 34-6s-2e, Custer County, reportedly made oil on tests, blew out, and was out of control for several days. The operator reportedly will complete the well as an oil producer. Production at Helms' discovery was 80 bbl. of oil per day from the Leo sand. South Dakota's other producing area is Buffalo field in the northwestern corner of the state. That Williston basin field has Red River-Ordovician production.

NEBRASKA

Kimball County Discovery Tested in "J" Sand

Recovery of 4,300 ft. of oil and 200 ft. of oil and gas-cut mud was reported on a "J" sand drill-stem test at Braden Drilling Co.'s 1 Barth in C NW NE 15-16n-58w, Kimball County.

The test was made at 7,118-40 ft. Location of this new pool-opener prospect is 2 miles northwest of Burdick field, extending Kimball County production 2 miles northwest. Burdick field was opened earlier at Frontier Refining Co. 2 Burdick, C NW NW 24-16n-58w. Pump potential was 125 bbl. per day. There has been only scattered drilling in the area between Braden's new strike and Burdick field itself.

PACIFIC COAST

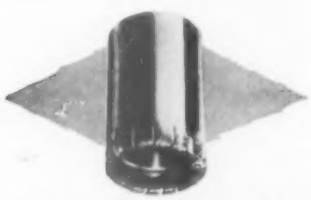
CALIFORNIA

Richfield Nears New Wheeler Ridge Find

Richfield Oil Corp. was reported to be nearing a new pool discovery in the "52" sand at Wheeler Ridge with a wildcat located nearly ¾ of a mile northeast of their Windgap area discovery earlier this year. Richfield's latest test of this southern Kern County area, 16-30 Wheeler Ridge Community, has approximately 40 ft. of the "52" sand which the operator was testing. The depth of the wildcat was 9,398 ft.

Humble Scores at Semitropic

Humble Oil & Refining Co. scored a new oil pool discovery on the south flank of Semitropic gas field in Kern County. Humble completed 2 E. G. Williams flowing 80 bbl. daily of 29.4°-gravity crude. The test was selectively perforated between 7,377 and 7,615 ft. Total depth is 7,800 ft. Drill site falls about 2 miles southwest of nearest oil production in the Wasco field. Humble has staked a location for another extension test in the area about 1¼ miles southeast of the discovery.



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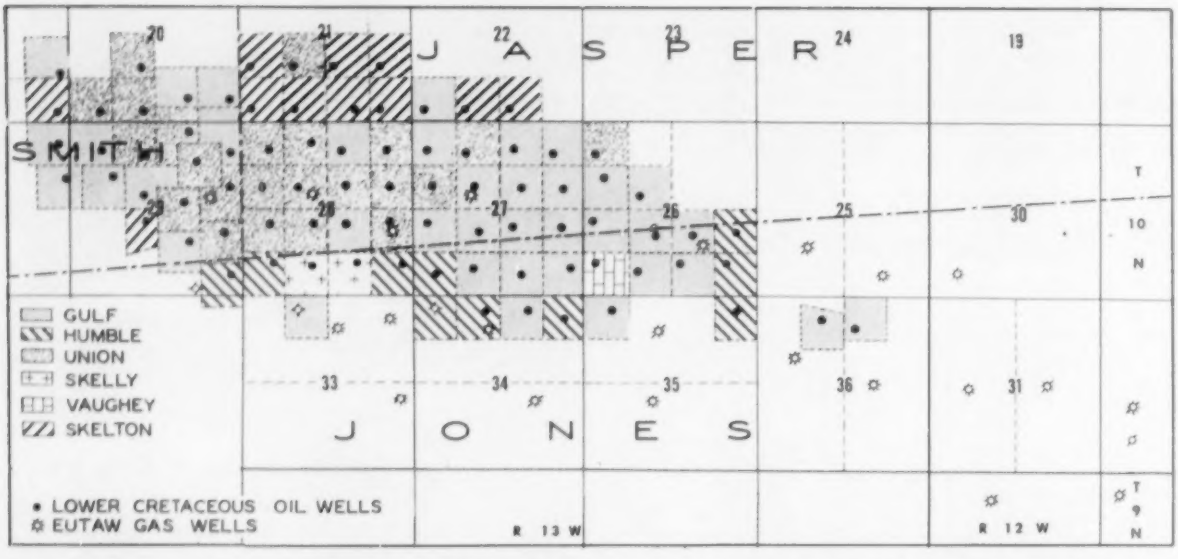


SOSO TODAY as a three-year drilling program in development of deep, Lower Cretaceous oil-productive sands in this Mississippi field draws to a close. The score—84 producible wells, all drilled to depths below 12,000 ft. and including 79 completed in the 12,000-ft. Sligo-Bailey zone, 4 in the 11,500-ft. Glen Rose-Rodessa zone, and 1 in the 9,750-ft. Paluxy zone. Gulf Refining Co., which opened the deep production in August 1953, leads with 37 wells; Union Producing Co. is next with 23 wells; D. W. Skelton operates 11 wells, including 5 drilled by himself, 4 by Evon A. Ford and associates, and 1 each by Brandon Co., and George D. Hunt and associates; Humble Oil & Refining Co. has 9; and Skelly Oil Co. and Vaughey & Vaughey, 2 each. Four deep tests, all at edge locations, were dry. At the height of development, throughout most of 1955, 12 to 15 rigs were kept busy. Only the discovery well and its confirmation were completed in 1953. Twenty-three were added in 1954, 48 in 1955, and 11 so far this year. Eutaw gas wells (in sands from 6,400 to 6,700 ft.) were completed prior to discovery of Lower Cretaceous production and had not been produced. (Base map by courtesy of Mississippi Oil and Gas Board.)

SOUTH TEXAS

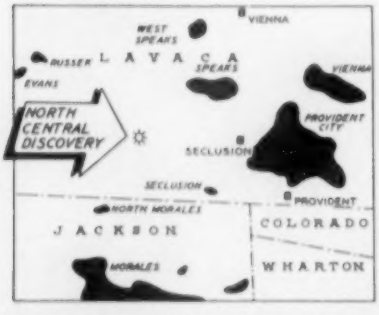
TEXAS GULF COAST

Gas-Condensate Producer Opens New Lavaca Field

North Central Oil Co. is opening another productive area in southern Lavaca County. Its discovery well, 1 Upchurch, is 4 miles east of Ezzell in the E. W. King Survey. It is 5 miles south of Speaks field, and about 7 miles southwest of the large Provident City field.

Production is gas and condensate from a 20-ft. perforated interval at 8,520-40 ft. The well is rated good for 4,300,000 cu. ft. of gas, open-flow, with a gas-liquid ratio of 46,500 cu. ft. per barrel. Gravity of the liquid is 50.1°. Shut-in pressure is 2,870 psi. Flowing pressure through 5/32-in. choke was 2,508 psi.

Hole was drilled to 9,025 ft. and is cased to 8,748 ft.



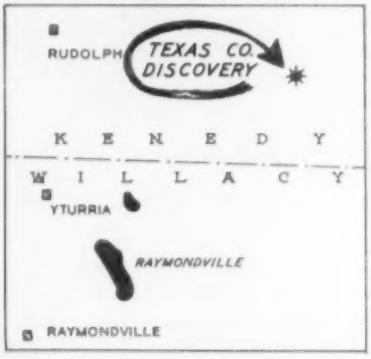
NORTH CENTRAL OIL CO.'S new discovery well (indicated) in southern Lavaca County.

New Gas Area Uncovered In South Kenedy County

A new gas-producing area has been opened by The Texas Co. on its large Yturria Land & Cattle Co. block in southeastern Kenedy and northern Willacy counties.

Discovery well, 11 Yturria, NCT-1, on the Kenedy County side of line (14,200 ft. north of it), is about 15 miles northeast of Raymondville. Except for an old, small oil well about 2 miles southwest, nearest production is 8 miles east in Humble Oil & Refining Co.'s Calandria field. It is 12 miles northeast of production in Raymondville field.

Production, gaged at 2,230,000 cu. ft. of gas per day through $\frac{7}{16}$-in. choke, is from an upper Frio sand, perforated at 8,430-44 ft. Gas sprayed some condensate ungaged. Pressure is 3,100 psi., flowing, and 3,300 psi., shut-in. Total depth is 8,515 ft.



RANK WILDCAT gas-discovery well (indicated by arrow) completed by The Texas Co. in southeastern Kenedy County.

SOUTH LOUISIANA

SOUTH LOUISIANA

Terrebonne Parish Wildcat Produces From Deep Sand

The active Houma area of Terrebonne Parish accounted for another gas-condensate discovery last week.

It was by Shell Oil Co. at its 1-A

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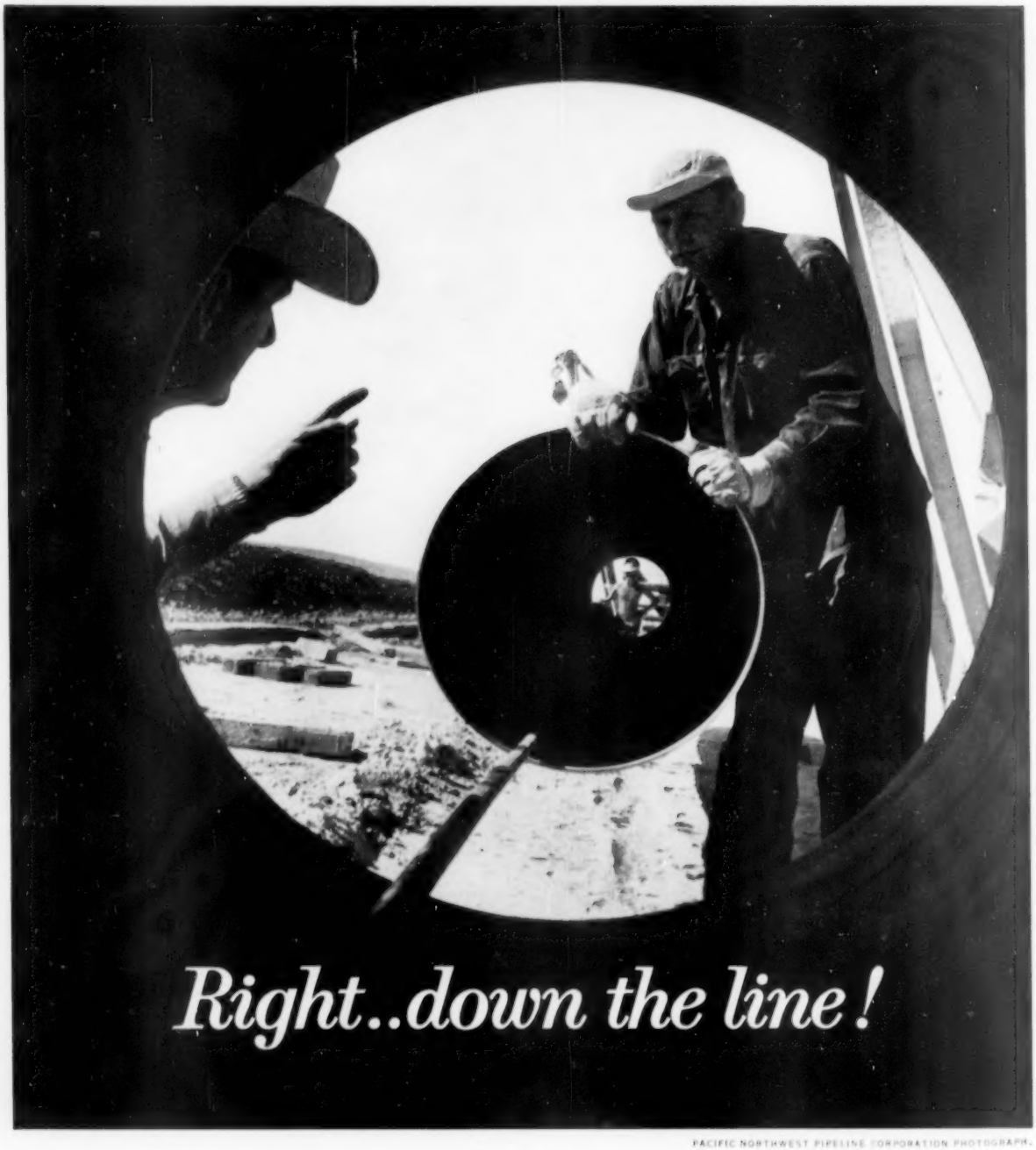

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Riggs, a deep wildcat test about 3 miles northwest of production at Orange Grove and about the same distance southeast of Shell's large Gibson field. It is about 10 miles southwest of Houma.

Shell's new well was drilled to 14,500 ft., has oil string cemented at 13,070 ft., and tested perforated interval, in Miocene sand, at 12,526-40 ft. Flow through 13/64-in. choke was at the rate of 4,260,000 cu. ft. of gas per day.

Liquid recovery was with the ratio of 21,846 cu. ft. of gas per barrel. Gravity of the liquid was 44°.

Shut-in pressure of the well is 7,560 psi.

SHELL OIL CO.'S new gas-condensate discovery-well (indicated by arrow) in Houma area of Terrebonne Parish.

Oil Discovery Extends East Bel City Field

Production in the East Bel City area, of Calcasieu Parish, is being extended 4,500 ft. eastward with a new-reservoir discovery by Trice Production Co., Lyons & Logan, and W. W. F. Oil Co., joint operators.

Their discovery well, 1 Derouen, has 42 ft. of oil pay in a sand section logged at 10,900-70 ft. The pay, perforated in a 5-ft. interval at 10,925-30 ft., produced at an estimated rate of more than 200 bbl. of 34.8°-gravity oil per day while testing through ⅛-in. choke. Flowing pressure was 1,400 psi. Pay is the Cibbicides-Hazzardi zone, in the lower Frio section.

In addition to the oil pay, the well logged 65 ft. of gas-condensate sand at 10,825-90 ft. It also had a total of 40 ft. (net) of gas-condensate sand in broken shows from 10,570-10,615 ft. Hole was drilled to 11,049 ft.

East Bel City field, discovered in 1948, has one producing well, operated by Sohio Petroleum Co. It is productive of gas and condensate from sand at 10,880 ft. Tests north, west, and south of this well have failed to get commercial production.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Andrews Well Flows Mississippian Oil

A Devonian wildcat test in Andrews County flowed oil in the Mississippian last week, giving a multipay field its second producer. The well is The Texas Co. 1 BR State, 23-6-University, 17 miles northeast of Andrews.

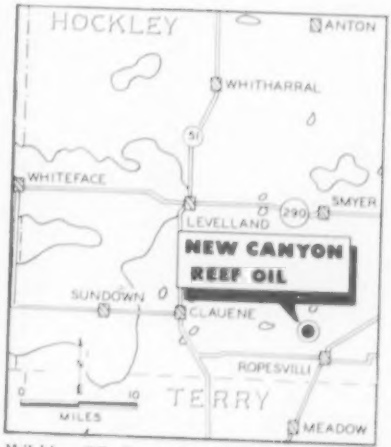
Texas went for the Devonian, but came up with 37½ bbl. of oil in 2 hours on a drill-stem test of the Mississippian at 11,933-99 ft. Drilling continues to contract depth at 12,800 ft.

This new producer in the Devonian field is ¼ mile north of the 1-BL State, a Devonian discovery completed last July for 196 bbl. per day on pump from perforations at 12,548-63 ft. That well also showed for production in the Mississippian.

Fasken Multipay Field Gets Ellenburger No. 2

The second Ellenburger producer in Fasken multipay field was reported at Magnolia Petroleum Co. 2-EE Fasken, 5-42-2n-G&MMB&A, 9 miles southeast of Andrews, Andrews County.

The well flowed 398 bbl. of oil per day from perforations at 12,557-12,616 ft. Magnolia will dually complete the well in the Wolfcamp at 8,418-54 ft. This will give the field its fourth Wolfcamp well.



Wilshire Oil Co. 12-8 Darby, Canyon reef discovery 2½ miles northwest of Ropesville in southeastern Hockley County, swabbed from 8-10 bbl. of new oil an hour after acidizing the reef between 10,375-90 ft.

Successful Wildcats

CALIFORNIA

Kern County: Humble Oil & Refining Co. 2 E. G. Williams, NW SW 24-27s-23e, 80 BOPD, 29.4° gravity, ½-in. choke, perfs. 7,377-90 ft., 7,413-90 ft. and 7,580-7,615 ft., TD 7,800 ft. (New oil pool discovery on south flank of Semitropic gas field.)

OKLAHOMA

Beaver County: White Eagle Oil Co.-Shell Oil Co. 1 Baldwin, C NE NE 30-1n-26eCM, IPF 235 BOPD, Missouri 5,984-6,016 ft., 20/64-, 39°, TD 8,632 ft. (Oil discovery in Hugoton embayment.)

WEST TEXAS

Winkler County: Stanolind Oil & Gas Co. 1 M. G. Damron, Sec. 10, Blk. B-2, PSL Sur., 10 miles NE of Kermit. IPP 25 BOPD, 34.9°, 9,416-36 ft. Devonian. TD 11,835 ft. (Oil discovery in Devonian.)

NORTH TEXAS

Foard County: Tennessee Gas Transmission Co. 1 C. M. Carroll, 12½ miles NW of Crowell in Sec. 36, Blk. A, SPRR Sur. IPF 149 BOPD, 18/64-in. choke, 40.2°, open hole, top pay 6,106 ft. TD 6,139 ft. (Oil discovery.)

South Texas Racks Up a Big One

(Continued from page 159)

imagined. The prolific Edwards oil fields in the Luling-Darst Creek region (F on map) and those of Atascosa County north and west of the new discovery are typical of the rich rewards to be reaped by the enterprising wildcatter. The small noncommercial field at Del Rio (G on map) has shown that the Edwards harbors oil in the far southwest counties along the Rio Grande. The discovery of Jurassic rocks in the dry holes at H and I on the map, 250 miles apart, projects that rock system into the "possible reservoir" category. And the dual gas discovery at J in the old Gause field of Milam County definitely points to Rodessa and Pettet reservoirs as future targets; at K, Seaboard Oil Co. carried its 1 Szalwinski to bottom in the Glen Rose at 11,800 ft. in Karnes County, proving the presence of those rocks in the vicinity of the new Atascosa strike.

Foreshadows bigger things to come . . . It may well be, in fact, that the Trinity rocks (Glen Rose-Rodessa-Pettet and Travis Peak) could overshadow the Edwards in discovery importance tomorrow. Already, operators in the new Fashing discovery area are looking at plans to test them soon.

Geologists have a lot to learn about the downdip Mesozoic rocks of South and South-Central Texas. And they're almost completely in the dark about the Paleozoics of the Edwards Plateau country. But nothing stimulates interest like a good discovery. Now they have it. And 2 years from now, we're going to write yet another column about the trend. It's that important.

Haas' Star Rises With Carter

CARTER OIL CO.'S newest director is an example of the bright young men whom Standard Oil Co. (N. J.) has been grooming in recent years for key positions in its companies around the world.

Merrill W. Haas, Carter exploration manager since November 1954, was elected to the board in April, capping an oil-finding career that spans 23 years—all of it with Jersey companies.

Haas joined Carter in Tulsa 6 years ago, fresh from the parent firm's new training program in New York. He was summoned back to Jersey headquarters from Venezuela, scene of the company's greatest exploration success, where he spent 16 years in positions of progressively greater responsibility.

Music to geology . . . Carter can thank parental persuasion for the decision which diverted its new board member from a musical career into geology.

A native of Albert, Kans., Haas grew up on a wheat farm bordering the community. In high school he earned $10 a night playing the piano with a dance band. He seriously considered making a career of music, a situation which his parents viewed with alarm.

"They convinced me it was too rough a grind," Haas remembers.

So music gave way to geology. He studied at the University of Kansas for 3 years, won a bachelor's degree from the University of Michigan in 1932, and followed up with a year's graduate work in paleontology at Harvard.

First job . . . Haas then joined Humble Oil & Refining Co. at Houston as paleontologist and was transferred in 1934 to La Salina, Venezuela, as district geologist for Lago Petroleum Corp., a predecessor to Creole Petroleum Corp.

His Caripito assignment with Standard Oil Co. of Venezuela 3 years later was his most important. It was there that he:

Became division geologist for Creole in 1941; married Maria Lara, Creole personnel employe, in 1944; and perfected his golf game until he shot in the high 70's consistently.

"The camp was built around a golf course," Haas explains. "We played 9 holes every afternoon after work, 18 on Saturday, and 36 on Sunday."

Returns to U. S. . . . The parent company brought him to New York in 1949 for his first domestic job since starting with Humble.

He was transferred to Carter the following year and served as staff geologist and chief geologist before assuming the top exploration position. Haas is responsible for Carter's aggressive oil-finding program. He is a strong proponent of decentralization and delegation of responsibility as the most effective means of carrying out that program.

Although far removed from Venezuela, he follows oil developments there as avidly as his alma mater's football fortunes. He feels that the country has many sizable fields as yet untapped by the drill.

In Tulsa, Haas no longer lives on a golf course, and being only a weekend golfer he has "slumped" to the 80's. Gone, too, is the afternoon siesta, an institution of which he grew fond while south of the border, and which he believes busy, pressure-ridden North Americans might adopt with advantage.

The piano, once the center of his life, is almost forgotten. He plays only rarely and then purely for his own amusement and relaxation.

Dr. George S. Hume, director of scientific service for Canada's Department of Mines and Technical Services, has joined Westcoast Transmission Co., Ltd., at Calgary. Hume leaves the government after 35 years' service.

Billy G. Nippert, district engineer with Arkansas Fuel Oil Corp., has been promoted to production foreman and transferred from Longview, Tex., to Alice, Tex.

R. K. Kelly, manager of Tidewater Oil Co.'s eastern division marine department, has been named to head the division's newly organized transportation department. Kelly joined Tidewater in 1929. During World War II he served as assistant director of supply and transportation with the Petroleum Administration for War.

A. B. MACAULAY

A. B. Macaulay has been appointed assistant to the vice president and general manager of Atlantic Refining Co.'s crude-oil production department. **Clarence E. Cardwell, Jr.,** will replace Macaulay as manager of Atlantic's domestic production administrative division. Macaulay has been with Atlantic since 1934. He has been manager of the company's administrative division since 1954. Cardwell formerly was assistant to the manager of the West Texas-New Mexico region.

R. E. Rust, formerly in the land department of Atlantic Refining Co., has resigned to become district manager for Petroleum, Inc., in newly opened offices at Shreveport, La. **Bill Ruffin** has been named district manager of the company's new Lafayette, La., office. **O. G. Franks,** regional manager, will be located in Lafayette.

J. W. Pennington, senior geologist with British-American Oil Producing Co., has been promoted to district geologist in Oklahoma City.

Forrest Bell, geologist with Sun Oil Co. in Dallas, has joined Don Montgomery of El Dorado, Ark. Bell is expected to open offices in Shreveport.

Jacques E. Renaud, formerly geologist for Canadian Gulf Oil Co., has joined Forest Oil Corp. in its newly created Canadian division at Calgary.

Dr. William S. Emerson, assistant development director with Monsanto Chemical Co. at St. Louis, has joined American Potash & Chemical Corp. as manager of research at the company's Whittier, Calif., research laboratory.

Robert O. Ledford, operations manager for Marine Gathering Co. of Houston, has been elected vice president. Marine Gathering is a subsidiary of Commonwealth Oil Co. of Houston. Ledford joined the company in 1950. He was previously construction superintendent with McCarthy Chemical Co., chief engineer for Barber Asphalt Co., and in the refining engineering department of Phillips Petroleum Co.

Edwin J. Barth, formerly consulting engineer with Gulf Oil Co., has been appointed lubricating oil and asphalt coordinator at the Iraqi Government's Daura refinery in Baghdad. Barth was previously with Nynas Petroleum Co., Stockholm, and Anglo-Mexican Oils, Ltd.

Robert W. Griffith, manager of gas division of Sunray Mid-Continent Oil Co.'s production department, has been named assistant to the vice president and production manager. **L. G. (Gayle) Rodgers,** D-X Sunray Oil Co. manufacturing department administrative assistant, will succeed Griffith in the gas division.

Joe A. Laird, consulting petroleum engineer, has been elected president of the newly formed Houston Luncheon Club of former Texas A. & M. College petroleum engineering students. Other officers are **R. P. Sanders,** vice chairman, production superintendent for M. E. Andrews; **George McGehee,** secretary, production superintendent for Fidelity Oil & Royaly Co.; **Ed McGhee,** publicity chairman, district editor, The Oil and Gas Journal.

Paul Purcell has moved offices of Purcell Exploration Service from Wichita Falls, Tex., to Dallas.

Eugene E. Morris, geologist with Phillips Petroleum Co. in Bartlesville, Okla., has been promoted to division development geologist and transferred to Evansville, Ind.

Gregory Hatch of Portsmouth, Ohio, has joined The Texas Co. at Oklahoma City as geologist.

Jack B. Antry has been named president of the Warren Drilling Co., Tulsa. **O. F. Warren,** chairman and principal chief executive officer of the company, recently announced formation of the new firm, which is a wholly owned subsidiary of the O. F. Warren Exploration Co. Antry, Warren and **N. B. Warren** are directors of the new company.

A. F. Beck, vice president and general manager of Canadian Export Gas, Ltd., has been elected president of the company. He replaces **Robert G. Campbell** who will continue as a director. **Paul C. Evans,** formerly manager of operations for the company, has been appointed vice president in charge of production. **Willis P. Hancock,** manager of exploration, has been named vice president in charge of exploration.

Personals

B. C. Wichterman, production engineer with Skelly Oil Co. at Carthage, Tex., has joined Atlantic Refining Co. in Dallas as production engineer.

JOHN M. BROWN

John M. Brown, assistant manager of Pan-Am Southern Corp.'s El Dorado, Ark., refinery, has been named manager. He succeeds **E. N. Kimes,** who has retired. **H. K. Wheeler,** assistant manager-technical, will replace Brown as assistant refinery manager. **J. D. Walk,** formerly of the manufacturing department of American Oil Co., has joined the El Dorado refinery as superintendent-technical.

Harry C. Jones, Service Pipe Line Co. division manager at Raytown, Mo., retired September 1. Jones has been in the pipeline industry over 40 years. He was assistant manager of Service Pipe Line's Oklahoma division in 1948, Nebraska division manager in 1952, and became Missouri division manager in 1955.

Friendly Visit Pays Off in 36-Year Job

ONE morning in 1920 a young man just returned from service with the A.E.F. intelligence section in Siberia dropped into a loft building on 45th Street in New York to visit an old friend.

The young fellow was John S. Cooke —his friend, E. H. Shaughnessy, who had just taken a new job with a big title: assistant director, Division of Transportation, American Petroleum Institute.

Shaughnessy offered Cooke a job on the spot as his secretary. The young man has been with A.P.I. ever since. He just recently rounded out 36 years of service to the oil industry.

In those 36 years Cooke has never missed an A.P.I. annual meeting. He has visited every state numerous times. Almost everyone in the oil industry knows and values "Doc" Cooke as a friend.

Cooke is the senior A.P.I. staff member in length of service. When the old transportation division was dissolved in 1924, he became secretary to W. R. Boyd, Jr., and served Boyd in his successive advances from assistant general secretary and counsel to president. For

many years he was secretary to the A.P.I. board of councillors and assistant secretary of the A.P.I.

More recently Cooke has been assistant to the A.P.I. director of information, secretary to the Oil Industry Information Committee, and secretary to the public-relations committee of the A.P.I. board.

Personals

John G. Voight, division geologist for Stanolind Oil & Gas Co. at Fort Worth, has resigned to open consulting geologist offices at Tyler, Tex.

W. L. Butte and **R. E. Mays** have been elected members of the board of directors of Creole Petroleum Corp. They replace **M. E. Jones** and **W. A. Greeven,** who have accepted positions with the parent company, Standard Oil Co. (N. J.) **D. E. Stines** has been named a vice president of Creole replacing **N. J. Campbell, Jr.,** who joins the parent company.

Dr. Charles L. Fleming, Jr., deputy coordinator for petroleum products and medical research for Esso Research & Engineering Co., has been elected a vice president and director. He succeeds **Dr. Carl O. Tongberg,** who has resigned to become a vice president and director of Carter Oil Co. **Dr. John G. McNab,** director of the products research division, will succeed Dr. Fleming as deputy coordinator. **Dr. Miller W. Swaney,** director of Enjay Laboratories, will replace Dr. McNab. **Elfried F. H. Pennekamp** will succeed Swaney at Enjay. **Harold J. Rose** has been appointed coordinator of chemicals research.

J. E. Ford, Jr., has been elected chairman of the board and chief executive officer of U. S. Oil & Refining Co., Tacoma, Wash. Ford was one of the founders of the company and has acted as its petroleum adviser for 18 months. He was previously connected with Sinclair Refining Co., M. W. Kellogg Co. and Houdry Process Corp. The company's new refinery at Tacoma is expected to go on stream this winter.

Dr. Bruno H. Wojcik has been named manager of research and development for the Industrial Chemicals Division of Olin Mathieson Chemical Corp. A graduate of the University of Illinois and the University of Wisconsin, Wojcik served on the chemical staff of the Manhattan Project during World War II. In other appointments, **Bernard H. Nicolaisen** became assistant manager of research and development in charge of the division's laboratories at Niagara Falls, N. Y., and **Dr. Chester White** will supervise the company's Rochester, N. Y., laboratories.

Forrest Hewitt has joined Colorado Oil & Gas Co. as a district geologist at Shreveport. He formerly was with Houston Oil Co. of Texas.

Henry C. Cortes, formerly assistant manager of exploration for Magnolia Petroleum Co., has been named a vice president of the company in charge of coordinating its offshore operations. He also is the director of the company responsible for Magnolia's fluid research laboratories. Cortes joined the geological department of the old Vacuum Oil Co. in 1924 and was transferred to Magnolia in 1932. **John W. Clark** has been promoted from chief geologist to assistant manager of the exploration department, replacing Cortes. Clark also worked for Vacuum and joined Magnolia in 1932. **Philip H. Jennings** has been promoted from assistant chief geologist to chief geologist replacing Clark. **Stuart Mossom,** formerly assistant manager of the company's natural-gas department, has been named coordinator of Magnolia's offshore operations and will work under Cortes' direction.

H. C. CORTES

J. W. CLARK

F. H. Taylor, Shell Oil Co.'s division production manager at Casper, Wyo., has been transferred to the Denver area office. **A. E. Cordray,** division exploitation engineer at Casper, also transferred to Denver. **R. A. Harrington,** division mechanical engineer at Casper has moved to Billings, Mont. The changes resulted from reorganization placing Shell's Casper production territory under the Billings division.

Robert S. Sloan, senior petroleum engineer with Stanolind Oil & Gas Co., has been transferred from Tulsa to Casper, Wyo.

Fred A. Dunham, plant superintendent at Sinclair Oil & Gas Co.'s gas products plant at Covington, Okla., has been transferred to become superintendent of the company's plant at Drumright, Okla. **Theodore W. Updike,** chief engineer of Sinclair's plant at Price, Tex., will succeed Dunham as superintendent at Covington. **Henry C. Sutton,** assistant chief engineer at the company's gas products plant near Longview, Tex., has been transferred to Price, Tex., to replace Updike as chief engineer.

James L. Bowen, development engineer for Shell Oil Co., has been transferred from the Los Angeles area office to Bakersfield. **Bob Kazarian,** development engineer, was transferred from the area office to Long Beach.

George H. Meason, formerly assistant division head in the technical and research department of Humble Oil & Refining Co.'s Baytown, Tex., refinery, has joined Tennessee Gas Transmission Co. in Houston as chief process engineer. Meason joined Humble in 1940. He is a graduate of the University of Texas.

Rex G. Baker, vice president and general counsel for Humble Oil & Refining Co., has retired. A graduate of the University of Texas, Baker joined Humble in 1920. He was named director and general counsel of the company in 1943 and has been a vice president since 1951. He will be succeeded by **Nelson Jones** as director and general counsel and by **Dillard W. Baker** as general attorney.

DEATHS

O. N. Andrew, sales manager for BJ Service, Inc., was killed in an automobile accident near Casper, Wyo., August 8. Andrew joined BJ in 1944 and served as superintendent of shooting, wire line supervisor, and Pacific Coast division manager before becoming sales manager.

R. H. Searcy, 81, pioneer independent oil operator and founder of Robert H. Searcy & Sons oil firm, died August 25 in Tulsa.

Richard H. Ernest, independent oil producer, died August 13 in Shreveport, La. A graduate of Columbia University, Ernest had operated in Nevada, Oklahoma, Kansas, and West Texas before going to Louisiana.

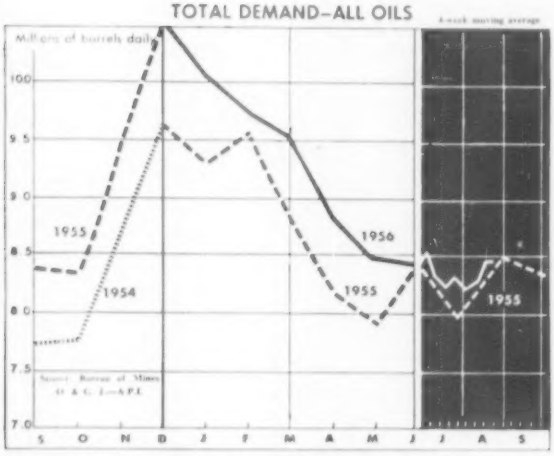
Don C. Ellswood, 49, manager of commercial and industrial sales for Southern Counties Gas Co., died August 23 in Santa Monica, Calif. Ellswood had been with Southern Counties since 1935.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,131,275	UP	7,300	UP	442,025
Crude stocks	277,065,000	UP	2,676,000	UP	14,596,000
Completions	1,147	DOWN	131	DOWN	16
Refinery runs	7,943,000	UP	44,000	UP	361,000
Gasoline stocks	175,816,000	DOWN	386,000	UP	21,118,000
Kerosine stocks	31,521,000	UP	804,000	DOWN	2,572,000
Distillate stocks	134,381,000	UP	5,447,000	UP	4,587,000
Residual stocks	46,069,000	UP	1,073,000	DOWN	390,000
Four-product stocks	387,787,000	UP	6,938,000	UP	22,743,000
Total imports	1,487,500	UP	162,700	UP	475,600

TOTAL DEMAND—ALL OILS



Suppliers May Be Hunting Clean Storage Before End of October

REFINERS' big problem over the next few months will be to find storage space for clean products. Reports by the Bureau of Mines show a gain of only 1.3 per cent in shell capacity of clean tanks at refineries, bulk terminals, and tank farms in the 6-month period from the first of October last year to April 1, 1956. Clean-product stock totals are running about 6.8 per cent above last year.

The table at the bottom of the page shows the seasonal trends in clean-product stocks with the stock level at the end of each month expressed as the per cent of total stocks at the start of the year.

The first three columns show trends for gasoline, middle distillate, and the two groups combined for the 5-year period from 1951 through 1955. Figures for summer and the early fall months have been adjusted to correct for abnormal stock changes brought about by the refinery strike in 1952.

Note that clean-product stocks normally decrease until about the end of April and then start back up. The peak for the year is reached soon after the end of October when the total is about 16 per cent greater than at the first of the year.

Refiners can expect increases in clean-product inventories for at least 2 more months. Weekly additions will be smaller in October, but when tanks are full every barrel is a problem.

At the start of this year, stocks of clean products totaled 303,536,000 bbl. for a gain of 12,166,000 bbl. or 4.2 per cent. The A.P.I. report for August 24 shows clean-product stocks at 341,718,000 bbl., up 23,133,000 bbl. or 7.3 per cent from the corresponding date last year.

Additional inventories at the first of the year could be considered about normal, considering the expected gains in demand. A comparison of the last two columns of the table shows how the changes this year stack up against the average for the 5-year period.

Relative stock positions were a little high for January and February, but late-season demand for heating oils brought stocks about in line with the 5-year average by the end of April. The big relative gains have been since the end of June.

The stock total at the end of last June was 97.8 per cent of the total for January 1 which is in line with the 97.7 per cent average over the past 5 years. Note that on August 24 the total was up to 112.5 per cent of stocks at the first of the year, a position that normally is not reached until some time near the end of September.

If high runs continue, product dumping and price cutting will highlight petroleum markets in September and October.

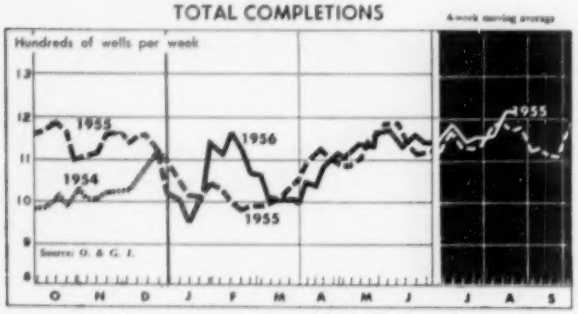
SEASONAL TRENDS IN CLEAN-PRODUCT STOCKS

(January 1 = 100)

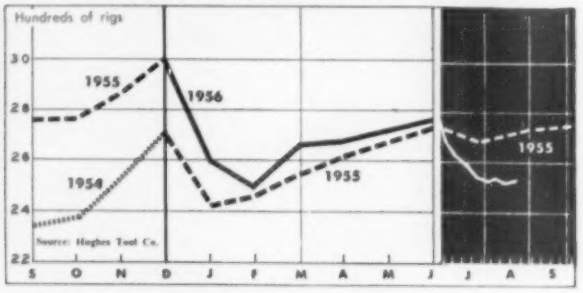
	1951-55			1956
	Gasoline	Middle distillate	Clean products	clean products
January 1	100.0	100.0	100.0	100.0
January 31	109.0	79.4	95.3	96.0
February 28	115.3	66.0	92.4	94.3
March 31	118.3	59.3	90.9	91.5
April 30	114.4	63.7	90.8	90.6
May 31	111.8	74.5	94.5	93.7
June 30	105.6	88.6	97.7	97.8
July 31	102.3	105.2	103.6	106.6
August 31	99.0	120.3	108.9	*112.5
September 30	98.2	130.4	113.3	
October 31	97.3	136.5	115.5	
November 30	100.3	129.5	113.8	
December 31	106.0	106.7	106.3	

*Weekly figures for August 24.

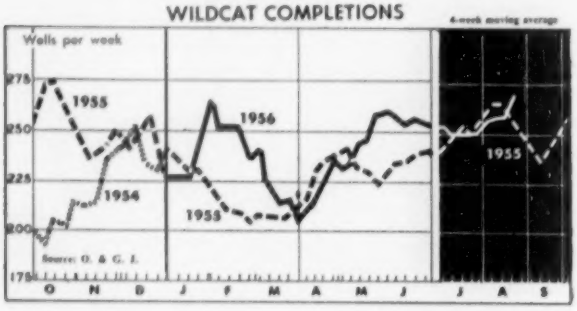
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	8-27-56	8-20-56	8-29-55
North Central and East	134	127	145
Southeast	34	31	31
Okla., Kans., Ark., Mo.	457	443	534
Louisiana	438	442	433
North and East Texas-Panhandle	379	364	379
Gulf and South Texas	233	232	236
West Texas-New Mexico	465	478	501
Rocky Mountain	278	274	326
Pacific Coast	118	118	136
Total United States	2,536	2,509	2,721
Western Canada	257	275	213

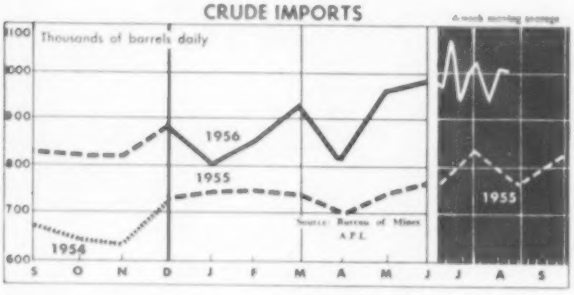
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 25, 1956

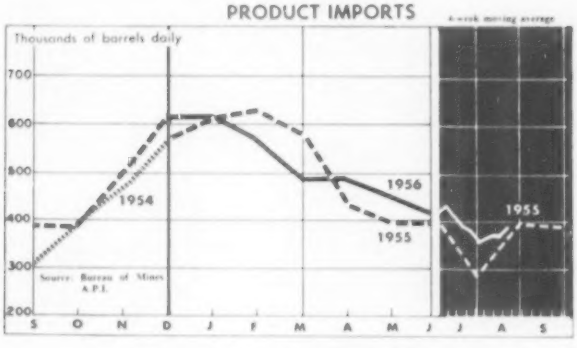
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	6	5	0	1	54,235	73	49	0	0	0	1	1	0	0	1	30	31
Arkansas	29	21	0	8	80,868	555	515	1	0	0	5	6	27	0	3	91	121
California	45	31	0	14	168,791	1,434	1,628	1	0	0	13	14	32	0	6	284	322
Colorado	22	3	2	17	117,358	762	946	0	0	0	14	14	18	0	11	359	388
Illinois	76	32	3	41	176,497	2,500	2,477	0	0	1	13	14	34	0	3	452	489
Indiana	10	6	1	3	14,851	422	486	0	0	0	1	1	13	0	1	75	89
Kansas	84	34	7	*43	293,118	3,327	3,327	6	0	1	12	19	82	2	20	593	697
Kentucky	47	15	5	27	70,576	1,184	935	0	0	0	11	11	26	0	1	251	278
Louisiana	69	31	11	27	373,980	2,515	2,565	0	1	2	12	15	80	37	43	343	503
North	43	24	7	12	136,840	1,075	1,342	0	0	0	6	6	21	2	3	140	166
South	21	7	4	10	185,136	1,153	1,223	0	1	2	4	7	47	31	28	178	284
Offshore	5	0	0	5	52,004	287		0	0	0	2	2	12	4	12	25	53
Michigan	9	2	0	7	27,345	288	339	0	0	0	5	5	6	0	1	100	107
Mississippi	9	2	0	7	72,838	290	305	0	0	0	6	6	12	1	1	124	138
Montana	18	4	1	13	81,520	276	223	0	0	0	10	10	10	0	1	90	101
Nebraska	13	5	0	8	73,035	667	513	0	0	0	7	7	27	0	0	297	324
New Mexico	61	20	26	15	237,901	1,266	1,085	0	0	0	13	13	33	0	6	129	168
Northwest	34	5	25	4	145,243	508	347	0	0	0	4	4	5	0	5	40	50
Southeast	27	15	1	11	92,658	758	738	0	0	0	9	9	28	0	1	89	118
North Dakota	4	3	0	1	29,766	163	155	0	0	0	1	1	8	0	0	43	51
Ohio	20	15	1	4	48,432	657	770	0	0	0	0	0	0	0	1	5	6
Oklahoma	161	94	3	†64	502,170	5,626	5,745	2	0	0	14	16	82	16	27	460	585
Pennsylvania-New York	3	0	3	0	10,062	750	1,070	0	0	0	0	0	0	0	5	11	16
Texas	417	236	15	166	1,981,381	14,657	13,204	16	1	1	99	117	498	25	119	3,067	3,709
Southwest (1 & 4)	56	30	2	24	235,395	2,122	2,023	0	0	0	18	18	92	5	43	577	717
Gulf Coast (2 & 3)	55	25	9	21	386,148	1,736	1,663	4	1	1	14	20	48	13	41	450	552
East (5 & 6)	32	11	3	18	155,319	754	637	1	0	0	9	10	11	1	5	255	272
N. Central (7-B & 9)	126	69	0	57	399,249	5,246	4,978	8	0	0	36	44	217	0	6	1,236	1,459
West (7-C & 8)	127	85	0	42	659,895	3,926	3,236	3	0	0	20	23	118	0	9	504	631
Panhandle (10)	21	16	1	4	145,375	873	667	0	0	0	2	2	12	6	15	45	78
Utah	0	0	0	0	0	83	58	0	0	0	0	0	3	0	3	43	49
West Virginia	7	1	6	0	17,858	424	400	0	0	0	0	0	0	0	6	7	13
Wyoming	32	16	0	16	143,146	537	545	0	0	0	6	6	9	0	7	133	149
Misc. Tenn., S. D.	5	0	0	5	18,530	70	21	0	0	0	5	5	4	0	0	58	62
Total U. S.	**1,147**	576	84	487	4,594,258	38,526	37,361	26	2	5	248	**281**	1,004	81	266	7,045	8,396
Total previous week	1,278	678	111	489	4,982,627			24	2	5	222	253	978	79	261	6,797	8,115
Total Aug. 27, 1955	1,163	625	82	456	4,678,405			35	0	1	208	244	1,080	135	236	6,451	7,902
Cumulative 1956	38,526	20,985	2,628	14,913	155,050,827												
Western Canada	65	43	4	18	242,127	1,899											

Service wells included: *2, †3.

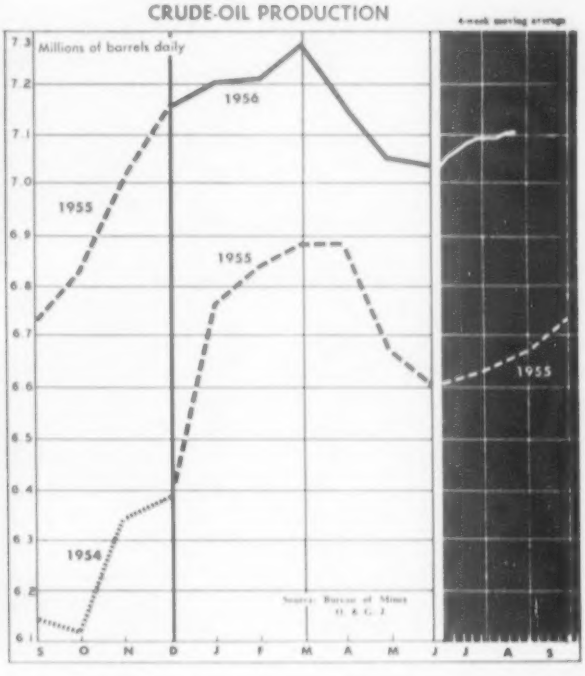
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



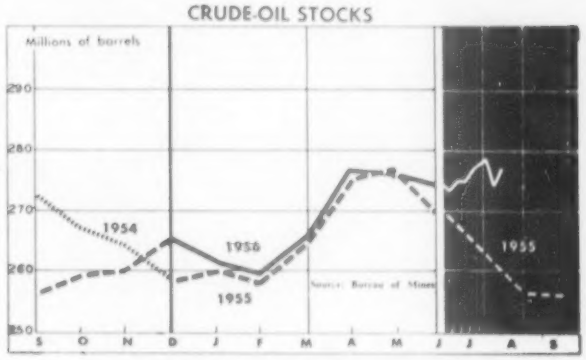
DAILY AVERAGE PRODUCTION FOR WEEK

August 25, 1956

	Crude oil	Lease condensate	Total	Aug. 18 total
Alabama	7,500		7,500	7,500
Arkansas	79,300	400	79,700	76,250
California	961,100		961,100	960,400
Colorado	161,400		161,400	158,800
Eastern	51,400		51,400	50,600
Florida	1,375		1,375	1,375
Illinois	231,000		231,000	230,400
Indiana	30,800		30,800	31,600
Kansas	344,200		344,200	343,500
Kentucky	47,300		47,300	46,700
Louisiana	732,950	55,600	788,550	791,200
North	118,950	2,100	121,050	123,700
South	614,000	53,500	667,500	667,500
Michigan	29,100		29,100	28,800
Mississippi	107,900	4,650	112,550	112,550
Montana	63,400		63,400	63,200
Nebraska	39,300		39,300	38,600
New Mexico	229,000	3,800	232,800	233,300
North Dakota	36,400		36,400	37,700
Oklahoma	591,200		591,200	587,800
Texas	2,980,500	47,800	3,028,300	3,028,300
Dist. 1	56,000	425	56,425	56,425
Dist. 2	146,000	7,925	153,925	153,925
Dist. 3	436,000	22,400	458,400	458,400
Dist. 4	239,000	5,700	244,700	244,700
Dist. 5	43,000	350	43,350	43,350
Dist. 6	125,000	5,300	130,300	130,300
East Texas Field	210,500		210,500	210,500
Dist. 7-B	158,000	50	158,050	158,050
Dist. 7-C	190,000	3,700	193,700	193,700
Dist. 8	1,060,000	1,500	1,061,500	1,061,500
Dist. 9	217,000	300	217,300	217,300
Dist. 10	100,000	150	100,150	100,150
Utah	7,000		7,000	5,500
Wyoming	286,600		286,600	289,700
Others	‡300		300	200
Total U. S.	7,019,025	112,250	**7,131,275**	7,123,975
Change from previous week, up			**7,300**	
Canada	†524,900		†524,900	†498,800
Total U. S. production January 1-August 25			1,701,593,850 bbl.	
Same period last year (crude plus cond.)			*1,598,444,116 bbl.	

*Includes 26,566,775 bbl. condensate. †Week ended previous Monday. ‡S. Dak. 100, Nevada 200.

CRUDE-OIL STOCKS



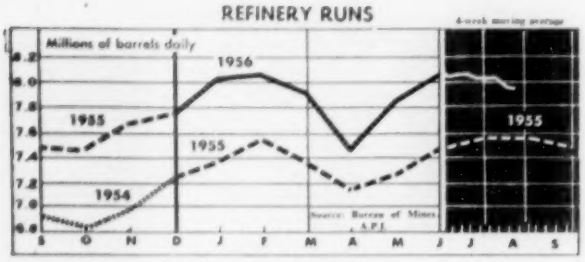
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

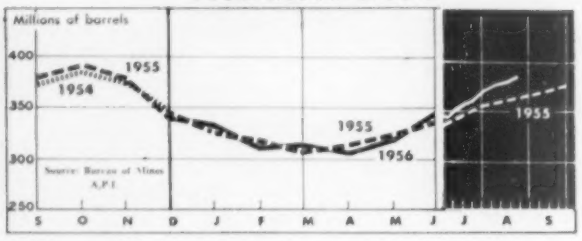
	8-18-56	8-11-56	8-20-55
Pennsylvania Grade	2,583	2,526	2,946
Other Appalachian	2,412	2,427	1,786
Illinois, Indiana, Michigan	10,907	10,436	11,351
Nebraska, North Dakota	2,188	2,131	2,342
Kansas	9,045	8,441	8,292
Oklahoma	27,428	27,395	21,560
Arkansas	2,644	2,716	2,834
Louisiana	16,470	16,001	16,114
North	2,674	2,472	2,821
South	13,796	13,529	13,293
Mississippi	3,261	3,255	2,843
New Mexico	7,880	8,378	7,543
Texas	123,854	122,451	123,551
East Texas proper	9,528	9,280	9,381
West Texas	60,172	58,782	51,113
Texas Gulf	22,513	23,069	24,534
Other Texas	31,641	31,320	32,523
Wyoming	19,802	20,024	14,763
Other Rocky Mountain	6,754	6,835	5,081
California	28,034	27,352	30,456
Foreign	13,803	14,021	11,007
Total	277,065	274,389	262,469

*Bureau of Mines. †Includes 3,357,000 bbl. in California.

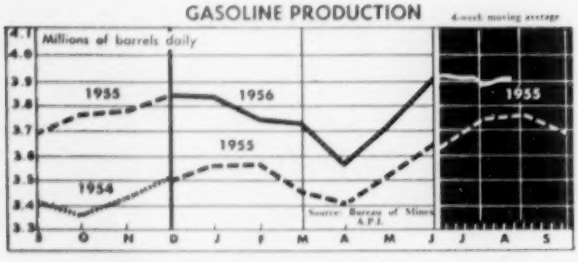
REFINERY RUNS



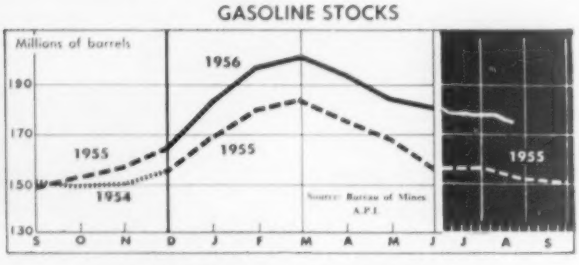
FOUR-PRODUCT STOCKS



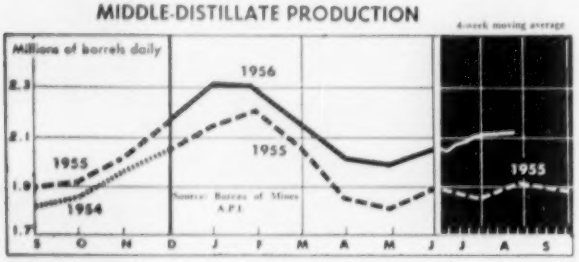
GASOLINE PRODUCTION



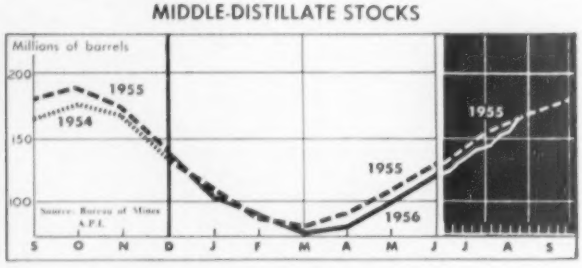
GASOLINE STOCKS



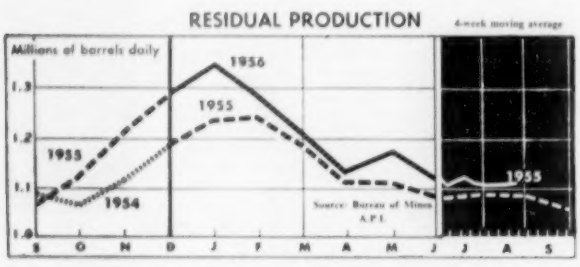
MIDDLE-DISTILLATE PRODUCTION



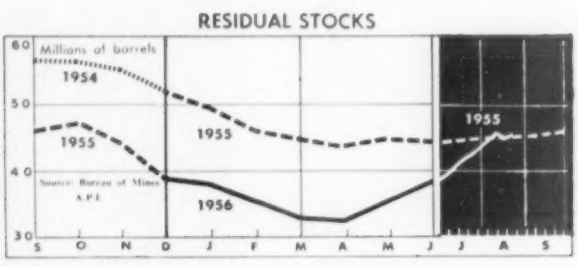
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 24, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,164	485.7	27.8	344.9	190.0	42,406	11,827	47,710	12,657	1,056	454.6	23.4	268.0	193.0
Appalachian:														
District 1	105	37.7	3.4	22.9	6.6	4,419	575	2,956	578	92	38.1	3.8	21.7	5.0
District 2	104	55.3	2.9	17.1	10.6	2,898	756	913	495	100	56.4	2.6	11.5	13.2
Ind., Ill., Ky.	1,406	743.6	66.3	279.7	150.7	31,018	6,902	19,405	5,284	1,372	735.2	65.8	263.1	146.6
Minn., Wis., Dak.	66	33.4	4.7	18.7	4.3	6,563	1,418	7,712	244	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	714	377.0	16.0	181.0	30.4	15,402	1,965	12,537	1,461	686	389.6	15.3	157.8	20.7
Inland Texas	288	209.7	5.9	56.3	28.2	6,878	583	1,927	1,624	257	181.3	8.4	51.3	20.8
Texas Gulf Coast	1,949	971.9	115.0	486.0	239.2	24,188	3,858	16,465	6,166	1,864	887.8	102.0	436.7	256.3
La. Gulf Coast	732	348.9	34.6	206.9	49.3	9,944	2,387	6,566	1,733	676	341.2	51.7	173.3	48.7
N. La. and Ark.	101	37.9	3.1	27.4	6.2	4,687	516	2,055	175	94	35.9	7.3	22.6	5.8
Rocky Mountain:														
New Mexico	24	12.7	0.3	4.7	2.7	390	9	103	23	21	11.4	0.2	3.7	3.2
Other Rocky Mtn.	282	129.1	4.9	57.1	37.4	5,543	419	3,267	889	278	130.0	3.7	58.0	37.3
West Coast	1,008	488.9	2.1	156.4	363.3	21,480	306	12,765	14,740	1,084	511.2	5.3	152.9	339.5
Aug. 24, 1956	7,943	3,931.9	287.0	1,859.1	1,118.9	175,816	31,521	134,381	46,069	7,580	3,772.7	289.5	1,620.6	1,090.1
Aug. 17, 1956	7,899	3,910.3	324.0	1,812.4	1,128.0	176,202	30,717	128,934	44,996					
Aug. 26, 1955	7,582	3,801.6	292.0	1,615.3	1,146.7	154,698	34,093	129,794	46,459					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, and Kentucky.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.25-11.75
Premium (96 octane)	13.25-13.75
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
Regular (84 octane)	12.6-13.3
Premium (93 octane)	14.7-15.3
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grades 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.125
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bulker-C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.i.	27
200 vis. neutral (180 at 100°), 25 p.i.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	12.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC+60%)	$4.56
★ N.W.I.-U.S.N.H., dirty (USMC+55%)	4.18
Lebanon-U.K., dirty (Scale+140%) (68s. 0d.)	9.46
★ P.G.-France, dirty (USMC+75%)	19.08

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2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

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6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
Tremendous selection stainless steel and steel valves ½"-6".
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KOBE PUMP UNIT, large type, used only 30 days, complete with LeRoi 100 HP motor, and high pressure pumps; 5000 ft. 1¼" tubing; brackets for 2½" tubing. New price approx. $14,000. Will sell at half of new price. Located at Odessa, Texas. Contact Ameera Oil Co., 141 El Camino Drive, Beverly Hills, Calif.

R. L. CARDWELL two-drum drilling in unit, good condition, large dog house; light plant; junk rack; 1,000 gallon Butane tank; tools for 5 and 7 inch hole; good lines. First check for $10,000 gets it. Write or phone John Richard, McClelland Hotel, Wichita, Kansas.

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Model 702CC Mortlex Flexible Couplings $15.00 ea. Complete.
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36-L BUCYRUS-ERIE with 5 and 7 in. tailing-in tools; dog house; light plant, butane tank. 101 So. Vine, Cleveland, Okla. Phone 614.

SACRIFICE due to illness, Ruska Vertical Magnetometer, used very little, price $1,000. Box J-631, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS COMPRESSORS—3 Bessemer type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

36-L BUCYRUS-ERIE Machine now drilling at Morton Grove, Ill. Milaeger Well Drilling Co., 1245 N. 62 Street, Milwaukee, Wisconsin. Phone GLenview 3-1230.

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Franks skid type rotary drilling rig complete, two new HRI (165 HP) Cummins Diesel engines; one completely overhauled 7¼" x 10" FXO Gardner-Denver pump. (Engines and pump used on three shallow wells). One 8' x 14' x 42' steel welded sub structure, made of "H" Beam and 7" pipe; two 5' x 7'1" x 28' ⅜" gauge welded steel mud pits, one string of 3436' of 3½" bottle neck drill pipe; ten 6¾" x 30' drill collars. (Drill pipe & collars used only in about 40,000' of drilling). One 82' Franks derrick type mast—pulls doubles.

This rig has been well maintained, is in good condition and ready to make hole to 4500'. Inventory, inspection and price upon request.

Box J-703, The Oil and Gas Journal, Tulsa, Oklahoma.

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FOR SALE: 500 KW power plant driven with 3 Worthington gas engines located at Mt. Pleasant, Texas, price $10,000. Contact American Liberty Oil Co. Engineering Department, Box 1011, Mt. Pleasant, Texas.

4" NEW STANDARD Line Pipe 10.79# C.W. Beveled Ends Tested 1200# PSI, SRL 80,000'. Prices right for immediate sale and delivery. Contact Box J-692, The Oil and Gas Journal, Tulsa, Oklahoma.

1 MODEL N-4 Brewster Double Drum with 2—WAKU Waukesha Engines, 7¼ x 12 FXZ Gardner-Denver Pump unitized with NKR Waukesha, 94' Lee C. Moore Mast, 6' Substructure, Steel Mud Pits, 5000' 4½" Drill Pipe, 21 Drill Collars. Iverson Supply Company, Odessa, Texas. Phone: FEderal 7-2349.

OIL WELL TUBING, SPOT DELIVERY
50,000' 2⅜" 4.6# Brand New E.W. Non Upset 10RD Thread T&C 3000 PSI average 16' lengths or will power buck 2 joints together to make range 2, at $.49 PFT, and 45,000' 2⅜" OD 4.7# Brand New E.W. External Upset 8RD Thread T&C 3000 PSI average 16' lengths, or will power buck 2 joints together to make Range 2, at $.59 PFT FOB St. Louis. Also have several strings 7" and 9⅝" OD Casing available as well as other sizes of casing and tubing. For details contact: A. J. STRUBEL, 4946 Murdoch, St. Louis 9, Mo. Office Phone: PRospect 2-2100. Residence: FLanders 1-8152.

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HELP WANTED

GRADUATE PETROLEUM ENGINEER, 4 to 6 years experience in drilling and production phases, for Oil Division of large substantial mining concern. Excellent growth potential! Base location, Denver, Colorado. Box J-698, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERINTENDENT — Independent engineering contractor has opening for construction superintendent experienced in gasoline plant and gas process.ng work. Send resume of experience with salary requirements. Box J-697, The Oil and Gas Journal, Tulsa, Oklahoma.

OPERATIONS ENGINEER

Growing independent oil company wants petroleum engineer with three to six years of practical, technical, and administrative experience for position in operations planning and control section. Some knowledge of valuation work and oil and gas law would also be helpful. Reply should furnish details on education, experience, and references, and state age and required starting salary.

BOX J-704,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. Tom Robinson, owner. Send brief resume education, experience, age, family status.

WANTED SUB-SURFACE GEOLOGIST. Independent oil company has opening in Illinois for sub-surface geologist with 3 to 5 years experience. Must be familiar with tri-state area. Exceptional opportunity for aggressive man. Applicant should supply complete resume of education, experience, qualifications, references, and salary expected. All replies confidential. Reply Box J-681, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING ENGINEERS
FOREIGN DRILLING OPERATION

Oil well drilling contractor has immediate opening for drilling engineers in Sicily and Africa. Liberal salary and bonus. Box J-679, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical and chemical engineers for work in drilling, pipeline and gas depts. Salary commensurate with experience.

Please send details of Experience to:

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HELP WANTED

PETROLEUM ENGINEER—2 to 3 years experience in drilling and production by aggressive independent. Unusual opportunities for qualified man. Furnish resume of experience and education, all replies confidential. Corpus Christi area. Reply to Box J-695, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS
(Ages 25 - 38)

RESERVOIR and PETROLEUM PRODUCTION ENGINEERS are needed in the expanding organization of major U. S. oil company operating in South America. Vacancies exist for graduate petroleum, chemical or mechanical engineers at levels requiring five to ten years of pertinent experience. Salary, including bonus, approximately $14,000-$17,000 depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete resume of personal data and work experience. Replies will of course be confidential and personal interviews will be arranged for qualified applicants.

BOX 480, DEPT. Y-21, NEW YORK 19, N. Y.

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San Francisco opportunity for senior electrical or mechanical engineers with experience on oil pipeline and pumping stations or gas pipeline and compressor stations.

Send resume to Manager of Employment & Placement
Industrial Relations Division

BECHTEL CORPORATION
220 Bush Street
San Francisco 4, Calif.

For an immediate personal interview you may phone:

Paul Keating, Murray Hill 7-7100, New York City
Joe Braddick, FAirfax 3-2401, Houston, Texas
Bill Milligan, TUcker 1549, Los Angeles, Calif.
Don Palmer, DOuglas 2-4032, San Francisco, Calif.

HELP WANTED

WE DESIRE a man under 35 years of age with preferably a minimum of 2 years university education, familiar with all phases of water well supply systems to become Field Manager of a Mid-Western firm. Reply in your handwriting, enclosing photograph and experience record to Box J-699, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

NATURAL GAS ENGINEER with engineering degree plus experience in plant design or operation. Location Tulsa. Amerada Petroleum Corporation, Gas Department, P. O. Box 2040, Tulsa, Oklahoma.

PIPELINE SUPERINTENDENT—Wyoming. Experienced. Not over 45 years age. Capable of handling pipe line system capacity 30,000 bbls. per day. Salary open. Write Box J-700, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER—Anderson-Prichard Oil Corporation has an opening in its Oklahoma City office for a reservoir engineer having a thorough knowledge of field operations. Applicants should write giving a personal history, resume of education and professional experience and salary expected. All applications will be confidential. Please address Anderson-Prichard Oil Corporation, Liberty Bank Building, Oklahoma City 2, Oklahoma. Attention: Mr. D. F. Tver, Industrial Relations Department.

NEED REPRESENTATION IN THE OIL COUNTRY

If you make a specialty or a standard line for the oil country, and desire good live representation in the Mid-Continent area, with oil business experience, acquaintance and "know-how", let us tell you how we can build up your sales.

BOX J-694,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOPHYSICIST

Major Oil Company in Venezuela seeks capable individual of directing technical end of seismic crew operations; make independent interpretations. Single man with 3 to 5 years experience preferred. Please send details of experience and education to:

P. O. BOX #35
Bowling Green Station
New York 4, New York

RESERVOIR ENGINEER

Strong, active independent oil company with diversified production in U.S.A. and Canada has excellent opportunity for a graduate engineer having 3-5 years of experience in reservoir analysis. Location—head operations office, South Texas. All replies confidential. Send details of education and experience, with an idea of salary expected, to

Box J-688,
The Oil and Gas Journal,
Tulsa, Oklahoma.

VALUATION ENGINEER

Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-690,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

SITUATIONS WANTED

PRODUCTION MAN: Married, age 39, 15 years experience. Best of reference. Box J-689, The Oil and Gas Journal, Tulsa, Oklahoma.

DISTRICT LANDMAN fifteen years with present Major Company now located in New Orleans desires change would prefer move to Houston with smaller Company or independent. Box J-702, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE MECHANICAL ENGINEER. 15 years broad experience in designing & manufacturing oil field equipment. Some drilling & production experience—desires responsible position such as project engineer, or research & development work on new products. Write Box J-705, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, age 37, with 15 years' experience in petro-chemicals, petroleum refining. Consider foreign or domestic employment. Previous foreign experience. Interested in job requiring mature judgment with commensurate pay. Box J-707, The Oil and Gas Journal, Tulsa, Oklahoma.

DIVISION ENGINEER with major oil company desires production or staff work with independent. Twelve years experience in foreign, Mid-Continent, Rocky Mountain and southern areas. Box J-706, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL ACCOUNTANT, 11 years with Independent Company, requiring initiative and executive ability. Wants job with Independent or operator. Consider salary and/or participation. Principle experience, Oklahoma and Kansas. Write Brooks, P. O. Box 783, Chickasha, Oklahoma.

EXECUTIVE—Eighteen years experience all phases Refinery and Chemical Plant design construction operations. Presently executive officer Foreign division of major American Engineering Contractor. Desires domestic employment. Reply Box J-683, The Oil and Gas Journal, Tulsa, Oklahoma.

ASST. DIVISION Exploration Manager. Age 35. Petroleum Geologist Degree. Desires key position with substantial independent or independent company. 12 years diversified experience Ark.-La.-Tex., Southern Canada, Williston Basin, West Texas and portions Mid-Continent and Rocky Mtn. areas. Presently employed major independent company. Past four years in advanced supervisory capacities with management training. Box J-703, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico
Phone 3-3141.
146 Allen Building, Midland, Texas
Phone 2-2962.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY. Periodic reports—maps—newsletter. Mail: VOSA, Apartado 3963, Caracas. Cables: VOSA, Caracas. Telephone 544802. Neal VanMiddlesworth.

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HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

40 ACRES & WELL DRILLED. $1500.00 for 1/2 interest. Center of oil producing area, Coweta Field. L. Price, Coweta, Okla.

FOR SALE: Oil & gas leases and drilling blocks. Write: Harvey Daugherty, Horse Branch, Ky.

FOR SALE or Development, large lease acreage over Oil Surface Seepage area. Contact E. A. Munyan, 102 Fairview Drive, Fairfax, Va.

EASTERN KANSAS, 700', 27 API stripper extension. Large estimated reserves if test holes prove trend indicated by recent drilling. Owner, Box 393, Lawrence, Kansas.

NEW MEXICO Oil Leases, Various Blocks, 40 acres $125. Write Box J-701, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL & GAS LEASE for sale—proven property—can set 6 locations on 77 acres—already has 3 electrified wells with direct oil and gas lines to consumer and with tank battery heaters and compressor station. PANHANDLE PIPE & SUPPLY Co. Box 1088, Borger, Texas.

North Chaves County, N. M.

Recommend to small or large buyers leases & royalty in Major Company blocks. Drilling or to drill. Developments indicate great potential possibilities. Data on request.

W. J. PETERMAN, GEOLOGIST
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Portales, New Mexico

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B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

WANTED

WE NEED MORE oil production. Any location in U. S. Minimum of $100,000. Box 194, Longmont, Colorado.

WANTED: Leases for drilling. Consider outright purchase or give override. Give legal description and geology, if available. Box J-685, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE FOR SALE

FOR LEASE: Lafayette, La., Entire air conditioned second floor, area 7500 square feet, triple A building, on the most prominent corner in the city. Suitable for high class business or offices. Will lease all, or part. Call or write. E. Ostrich, 810 Jefferson St., Phone CE 54528.

BUSINESS OPPORTUNITIES

HAVE CAPITAL available to develop oil properties for participating interest. Box J-512, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL CONTACT. Will consider placing proposition requiring corporate financing on Underwriting basis. Confidential. Write Consultant, 817 51st St., Brooklyn, N. Y.

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PRODUCTION FOR SALE

FOR SALE: 120 barrel per day production. Established water flood leases. 735 acres left to be drilled in proven area. Excellent reason for selling. Baldwin Production Corporation, Route 5, Medina, Ohio.

Industrial Sales Manager Named by Electro-Motive

Appointment of Frank B. Doonan as industrial sales engineer in charge of the new sales and service office for Electro-Motive Division of General Motors at Morgan City, La., is announced by D. H. Queeney, industrial sales manager of Electro-Motive.

The new office, in the Offshore Oil Center, will serve customers for Electro-Motive's diesel electric-power systems for oil-well drilling.

Beginning as an electrical tester in the inspection and test department in 1949, Doonan has served in experimental test in the engineering department, in the electrical-control section of engineering, and in 1955 was made a member of the Electro-Motive industrial sales department.

Bellinger Appointed Condit Sales Engineer

The appointment of Albert L. Bellinger as sales engineer has been announced by D. J. Condit, of The Condit Co., distributor of process and control equipment. Bellinger was with Pittsburgh Valve & Fittings Co.

Bellinger's immediate assignment will be sales-engineering work in the firm's Tulsa headquarters. The Condit Co. maintains a branch office in Kansas City.

LEGAL

SEALED BIDS will be received until 2:00 P.M. Pacific Standard Time, September 28th, and opened at that time in the Office of the Western Washington Indian Agency, Everett, Washington for the leasing of 255.38 acres of Tribal land and 1314.10 acres of allotted Indian land, located in Townships 23 and 24 Range 13 West, County of Grays Harbor and Jefferson, Washington for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Western Washington Indian Agency, at P. O. Box 915, Everett, Washington.

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MONTANA

Rank Wildcat Announced For Sheridan County

A 7,200-ft. Mission Canyon wildcat was announced for the extreme northeastern county in Montana. The Texas Co. made location for the 1 McNulty in C NE SW 27-35n-54e, Sheridan County, 32 miles northeast of nearest production at Northeast Bredette field.

Sheridan County is the least-drilled county in Montana's portion of the Williston basin. Only scattered drilling is on the records both across the border to the north in Canada, and to the east in Divide County, North Dakota.

NORTH TEXAS

Montague County: Star Oil Co., Inc. 1 Roger Cowden, 5 miles W of Belcherville in W. H. Garland Sur. A-304. IPF 305 BOPD, 24/64-in. choke, 40°, Caddo conglomerate 5,552-62 ft. TD 5,840 ft. (New oil pay discovery.)

Young County: Wesley Stephens et al 5 Stoffers, 10 miles S of Graham on J. A. Driver Sur. A-2037. IPF 45 BOPD, 10/64-in. choke 39, Strawn 1,780-89 ft. TD 2,638 ft. (Oil discovery.)

WEST TEXAS BORDER COUNTIES

Nolan County: Sun Oil Co. 1-A E. Parramore, 21 miles SW of Sweetwater in Sec. 83, Blk. 1-A, H&TC Sur. IPF 146 BOPD, 11/64-in., Canyon sand 5,718-34 ft., GOR 1,845/1, 46.4°, TD 7,300 ft. (New oil discovery.)

WEST CENTRAL TEXAS

Callahan County: Wayne Babb et al 1 W. T. McClure, 8 miles S of Putnam in E. Shipman Sur. IPF 20 BOPD, Caddo lime 3,004-12 ft., 48°, TD 3,200 ft. (Oil discovery.)

Moore & Gilmore 1-A R. D. Williams, 8 miles NE of Baird in Sec. 1, G&M R.R. Sur. IPF 105 BOPD, Moran sand 2,641-62 ft., 40°, TD 2,740 ft. (Oil discovery.)

Jones County: Ambassador Oil Corp. 1 Julia Woodward, 5 miles W of Anson in Sec. 51, Blk. 2, CPRR Sur. IPP 88 BOPD, 8,846-52 ft., 39.4°, TD 5,010 ft. (Oil discovery.)

Another new development using

B.F.Goodrich Chemical *raw materials*

Hycar rubber part for Baker Oil Tools, Inc. supplied by Plastic and Rubber Company, Los Angeles, Calif.

Hycar packing element fights off heat, pressure, corrosive materials to protect casing

THIS drillable production packer made by Baker Oil Tools is specially designed for sealing between casing and tubing in deep, high-pressure, high-temperature oil wells. Under these conditions an exceptional packing material is required to protect the casing from high formation pressures and corrosive substances, and prolong casing life.

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Hycar rubber materials are extremely tough, abrasion resistant, oil and water resistant, resilient at temperature extremes. For your tough materials problems investigate Hycar. Write Dept. EN-5, B.F.Goodrich Chemical Company, 3135 Euclid Ave., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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● This Reactor in the Expansion of a Gulf Coast Refining Plant operates at 530 pounds W.P., and temperature of 750°F.

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87,600 TON-MILES
46,597 FEET OF HOLE
4.7¢/TON-MILE COSTS
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425 ROUND TRIPS

. . . records made by the crew of Rig 111, Harry Bass Drilling Co., with YELLOW STRAND LINES

Look over the records for real proof that Yellow Strand Drilling Lines offer you the best bet for making hole at lowest cost.

Another Yellow Strand record has been set by the crew of Rig 111, of the Harry Bass Drilling Co., Dallas, working in the Pegasus Field of West Texas. With expert attention from the crew, the 6,000′ reel of 1¼″ IWRC Yellow Strand Rotary Drilling Line was able to amass a total of 425 round trips, 87,600 ton miles of service, 46,597 feet of West Texas hole. The line delivered 14.6 ton miles of service per foot at a cost of only $0.047 per ton mile.

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Rig 111, an Emsco J-1250, is one of six operated by Harry Bass Drilling Co. All are rigged-up with Yellow Strand Rotary Lines, tong lines and jerk lines, supplied by Continental Supply Co., Broderick & Bascom Oilfield Distributors.

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